

CUSTOM BIOGENIC SYSTEMS

ISOTHERMAL CAROUSEL FREEZER

2301 OPERATORS MANUAL



Custom
BioGenic
Systems

www.custombiogenics.com
150 Shafer Drive • Romeo, MI 48065 • USA
1.800.523.0072 • Tel: 1.586.331.2600 • Fax: 1.586.331.2588



Leading the World with Innovative Cryopreservation Technology Solutions

European Authorized Representative
EMERGO GROUP
Molenstraat 15
2513 BH, The Hague
The Netherlands

EC

REP

IMPORTANT INFORMATION

We at Custom Biogenic Systems are proud of our work, and appreciate your purchase of this product. With proper care, this equipment will be trouble-free for many years to come. Before setting up and using your new cryogenic storage unit, first check to see that all parts are accounted for and that no damage has occurred during shipping. Also, read this manual completely before proceeding to set-up. If at any time you are unsure of the procedures for set-up and use of this product, please contact CBS or your CBS sales representative.

NOTE: If equipment is used in a manner not specified by Custom Biogenic Systems, the protection provided by the equipment will be impaired.

PRODUCT WARRANTY

Custom Biogenic Systems warrants all manufactured cryogenic equipment to be free from defects in workmanship or materials for a period of three years.

Custom Biogenic Systems' liabilities under the warranty shall be limited to correcting or replacing defective workmanship or materials. A claimant under the warranty must notify Custom Biogenic Systems within (10) days after the discovery of the defect. Custom Biogenic Systems reserves the right, at their discretion, to correct the defect(s) in the field without return shipment to the factory.

This warranty does not cover defects on cryogenic equipment resulting from abusive handling and subsequent structural failure.

Serial Number _____

Model number _____

For Technical Assistance Call: 1.800.523.0072 (U.S. Only)

Phone: 586.331.2600 Fax: 586.331.2588

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RECOMMENDED BEST PRACTICES

Custom BioGenic Systems “Recommended Best Practices” for safe product storage

Secondary or backup alarm

It is strongly recommended to have, at a minimum, an ***Independent Temperature Alarm*** for each LN2 freezer.

Remote alarm connection

It is strongly recommended to have, at a minimum, a ***Remote Auto Dialer*** connected to your Delta Room, Facility Monitoring Station or Remote Auto Dialer for each LN2 freezer.

Split Samples

Separate samples in to two different freezers.

Keep a daily log

Track temperature levels daily.

Record fill intervals and amount of LN2 filled into vessel (manual or pour-fill freezer or dewar).

This information should be documented daily and reviewed monthly to foresee and prevent future problems such as temperature fluctuations and varying liquid levels.

Prepare a contact list

Have at least 3 people on your contact list with Home, Cell and Pager Number. Review the list regularly for accuracy and changes.

Contingency plan

What to do if no one returns a call from your call list.

What to do if we run out of LN2 and it is a weekend or holiday.

What to do if you have a High Temp Alarm.

What to do if you have a Low Level Alarm.

What to do if you have a High Level Alarm.

What to do if you lose power.

What to do if you get a Source Alarm.

QUESTIONS and ANSWERS

Keep your most important, irreplaceable product safe.

You can plan for the future, you can't change the past.

Back-up or secondary Temp Alarm

Q: Why do I need a Secondary or Back-Up Alarm?

A: Your freezer is a mechanical device and could malfunction. By having a secondary or back-up alarm you can minimize the possibility of a loss due to a malfunction.

Q: Why a Temperature Alarm and not a Liquid Level Alarm?

A: Your LN2 freezer and specimens depend on the temperature of the freezer. Even though you are using the liquid level to control the temperature of your freezer and keep your specimens safe, it is the more efficient to detect changes in the temperature. In order to prevent cross contamination, vapor or dry storage is becoming the preferred method of storing samples. Therefore, the samples are not immersed in to liquid nitrogen and monitoring the temperature is the most important variable. An independent temperature verification may be required.

Remote Alarm Connection to your Delta Room, Facility Monitoring Station or Remote Auto Dialer

Q: Why should I use my remote alarm feature or connection?

A: If an alarm occurs after hours, on a weekend or holiday the remote alarm connection will alert you to a problem and let you address it quickly.

Q: I am not sure how to connect the alarm or what to connect the alarm to.

A: First, contact your lab manager, supervisor or in house biotech representative. If no one is sure what to do, contact CBS customer service for help and direction.

Q: What is an Auto Dialer and why would I use one?

A: An Auto Dialer is used when a central connection is not available for the remote alarm. When connected to a telephone land line the Auto Dialer will dial up to 8 different contacts.

If you have any question, comments or concerns please contact:

Custom BioGenic Systems Customer Service

Phone 586.331.2600

Toll free (US only) 800.523.0072

Email sales@custombiogenics.com

LIQUID NITROGEN SAFETY

IMPORTANT: The following section on LIQUID NITROGEN SAFETY should be read carefully and be followed completely, but is by no means a complete volume on the safe use of cryogenic liquids. All personnel should have a complete knowledge of the correct procedures, as well as the hazards of working with liquid nitrogen. Failure to do so could result in serious injury or death.



LIQUID NITROGEN IS AN EXTREMELY COLD LIQUID - LIQUID NITROGEN EXISTS AT -196°C. BECAUSE OF THESE COLD TEMPERATURES, LIQUID NITROGEN WILL CREATE A FROSTBITE IF IT COMES INTO CONTACT WITH SKIN. NEVER ALLOW DIRECT SKIN CONTACT WITH LIQUID NITROGEN OR SERIOUS FROSTBITE WILL RESULT.

ALTHOUGH LIQUID NITROGEN ITSELF IS NON-TOXIC, WHEN RELEASED INTO A CONFINED SPACE IT CAN DISPLACE OXYGEN CAUSING ASPHYXIATION. ENTERING AN OXYGEN DEFICIENT ROOM CAN CAUSE UNCONSCIOUSNESS WITHOUT WARNING. ALWAYS CHECK AIR QUALITY UPON ENTERING A ROOM WHERE CRYOGENIC LIQUIDS ARE BEING USED, AND IF POSSIBLE, HAVE AIR RESPIRATORS AVAILABLE.

INTRODUCING EQUIPMENT WHICH IS AT ROOM TEMPERATURE INTO LIQUID NITROGEN IS ALWAYS SOMEWHAT HAZARDOUS. BEWARE OF SPLASHING AND "BOILING" WHICH MAY OCCUR. ALL PERSONNEL PERFORMING THESE OPERATIONS SHOULD BE FULLY INFORMED OF PROPER HANDLING PROCEDURES, AND SHOULD ALWAYS WEAR A FACE SHIELD AND PROTECTIVE CLOTHING.

LIQUID NITROGEN SHOULD NEVER BE USED IN COMBINATION WITH OTHER SUBSTANCES WITHOUT KNOWING WHAT THE RESULT WILL BE. WHEN IN DOUBT, CONTACT A COMPETENT AUTHORITY.

LIQUID NITROGEN SAFETY

HANDLING LIQUID NITROGEN

Personnel handling liquid nitrogen should be thoroughly instructed as to the nature of these materials. Proper training is essential to safety, and will ensure the accident-free use of this equipment.

Because of its low temperature, liquid nitrogen will cause frostbite to the skin much in the same way as hot liquids can burn. For this reason, always wear the proper protective clothing when handling these materials. It is advised that during use, handlers of liquid nitrogen should protect themselves by wearing goggles or face shields, cryogenic gloves (large enough to allow quick removal) and a cryogenic apron. It is preferable that shoes worn at these times have high tops, as to not permit accidentally spilled liquid from entering, as well as pant legs which come down over the tops of shoes for further protection.

Also because of the extremely low temperatures, liquid nitrogen should only be handled and transported in approved containers. Many materials become brittle and may shatter when put into contact with liquid nitrogen.

FIRST AID

In the event a person has a frostbite from liquid nitrogen, the following first aid treatment should be given while awaiting the arrival of medics or a doctor:

1. If the material has contacted skin or eyes, flood those areas with large quantities of unheated water and protect frozen areas with loose, bulky, dry, and sterile dressings.
2. If the skin is blistered or there is a chance that the eyes have been affected, seek medical help immediately.

V SERIES CAROUSEL DESCRIPTION

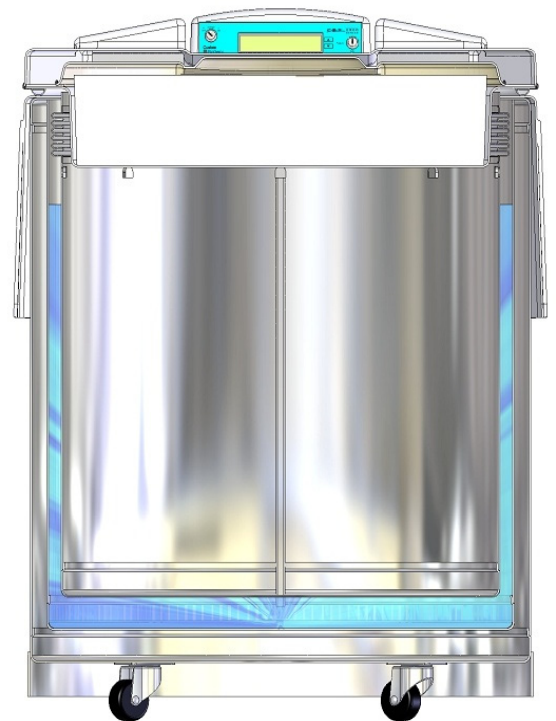
Throughout this manual references are made to the “V Series Carousel” storage unit vessel. In order to give a complete understanding of the carousel model, the diagram at the right is provided.

With the V Series Carousel model, the liquid nitrogen is contained inside the vessel walls, and the stored samples inside the carousel never come into contact with the liquid nitrogen except in the case of an accidental overfill.

To understand the way the system operates, see the OPERATION section on the next page for a basic explanation of the mechanics of the system. Also, be sure to read this manual completely before attempting to use this equipment. If you are still not sure how to use this equipment properly, contact a competent authority, rather than risking your safety or the safety of the stored samples.

When the unit is placed into service, check daily to ensure proper operation and safety of the stored samples. For the V Series carousel units, it is essential to lift the lid each day and check for vapor and signs of proper freezing.

V SERIES (ISOTHERMAL) VESSEL
LIQUID NITROGEN IS CONTAINED INSIDE
THE VESSEL WALLS, AND DOES NOT
CONTACT THE INVENTORY SYSTEM.



INITIAL SET-UP

This equipment is designed to operate in the following environmental conditions:

Temperature: 5°C (41°F) to 40°C (104°F)

Humidity: 80% at ≤ 31°C, decreasing linearly to 50% at 40°C

Altitude: ≤ 2,000 meters (6,650 feet)



Whenever working with Liquid Nitrogen in an enclosed space, the use of personal O₂ detection equipment is recommended.



As a first step in the set-up procedure, be sure to read this manual completely to become more familiar with this equipment. Next, remove all packing materials and wipe unit with a clean cloth inside and out to remove any debris left from shipping. Once the unit is wiped down, complete the following Steps: **(Note: The Temp A/Temp B alarm is set at +30°C from the factory. Thus, it will not alarm during the first fill and must be set by the user once the freezer cools. (-150°C)**

1. (Connect the LN² stainless steel flexible hose from the supply tank to the storage freezer), but do not open the manual supply valve until instructed to do so.
2. Connect Remote Alarm or Auto Dialer if desired.
3. Plug unit into an appropriate power source.
4. Turn the power key switch to the "ON" position and the program/lock to program.
5. Adjust the Liquid Level Set points. See display #4 on page 16 for instructions. **(press LIQ'D level)**
6. Adjust the High Temperature Alarm Set point after filling is complete. See display #5 on page 16 for instructions. **(press "TEMP")**
7. Open the manual valve on the supply tank. Check for leaks at the connection points, then proceed to normal operation.

OPERATION



Storage units should not be disconnected from their supply while attempting to fill.



The **V Series Carousel** Storage Units are designed to maintain liquid nitrogen levels within specified parameters *inside the walls* of a cryogenic storage vessel. This is achieved by measuring gravitational weight of the liquid nitrogen with a pressure sensing unit in the controller. The controller activates the **FILL** solenoid valve when the liquid level goes below the **LOW** level set point, and deactivates the solenoid valve, stopping the fill, when the level reaches the **HIGH** set point.

The Bypass Function has an additional solenoid valve to vent vapor from the transfer lines before the **FILL** solenoid is activated. In the description below, the part of the sequence which is unique to the Bypass Function is in *[brackets]*. All other information refers to units with or without the Bypass Function.

During regular operation, the sequence of events is as follows: When the liquid level in the vessel falls below the low level set point, a signal is sent to the controller. At this time the **FILL** solenoid valve is activated, allowing the flow of liquid into the vessel. *[The Bypass Function will activate the **VENT** solenoid first to release gas or vapor from the transfer lines. The venting will continue until the line temperature reaches approximately -150° to -160°C. This can be adjusted, consult the factory for more information. When the line reaches this temperature the vessel will begin to fill.]* When the liquid level reaches the high level set point a signal is sent to the controller which deactivates the solenoid valve and stops the flow of liquid into the vessel. As long as the unit is powered up, this fill sequence repeats as necessary, maintaining the desired liquid level.

Check unit daily to ensure proper operation and safety of the stored samples. For the V Series Carousel units, it is essential to lift the lid each day and check for vapor and signs of proper freezing.

OPTIONAL CRYOMONITOR SOFTWARE

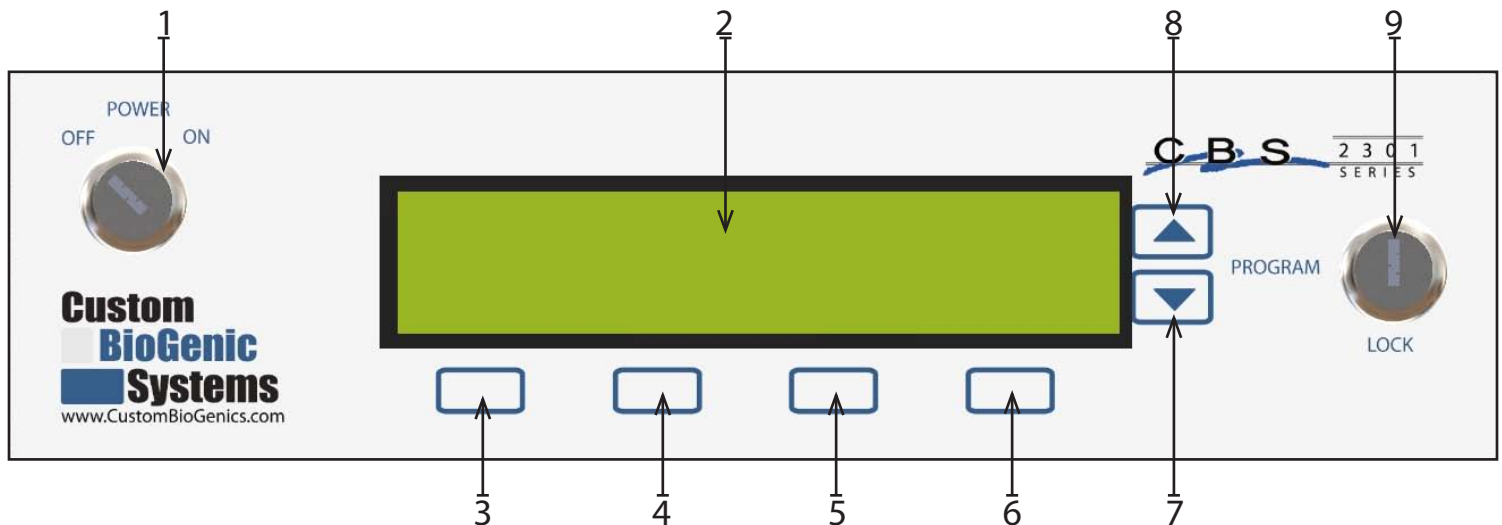
CryoMonitor software is available to connect your storage unit directly to a PC for full access to the setup and monitoring of the system electronics. Pictured below are the SETUP and DATABASE menus of the software. Contact Custom BioGenic Systems or your sales representative for more information about the CryoMonitor software.

2301 CRYOMONITOR SOFTWARE
VERSION 2.0 COMING SOON

FRONT PANEL CONTROLS

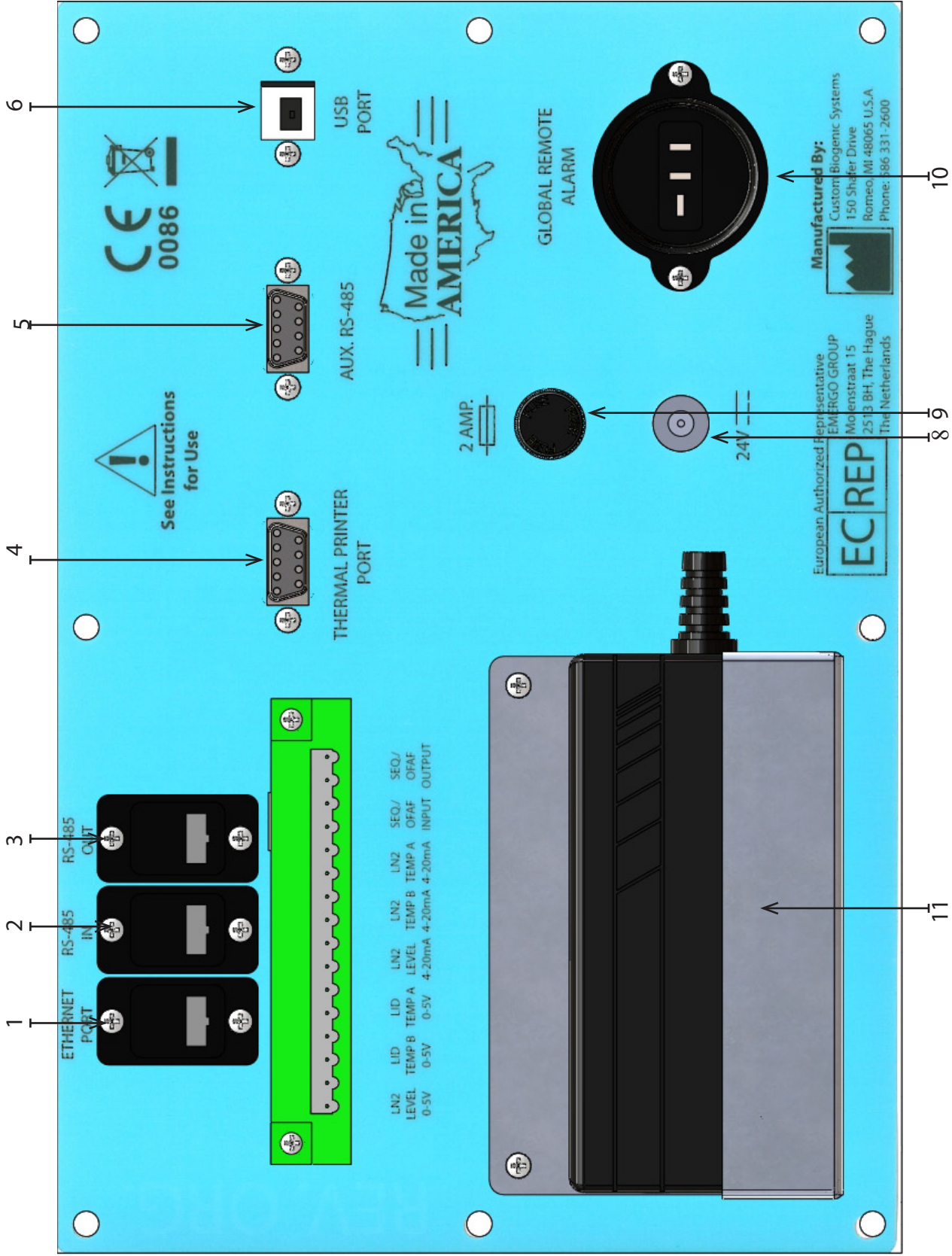


Warning: Depressing buttons with pointed objects (Pen, Pencil, etc.) will damage buttons



1. Key - Switch Power Control - Main power control for the unit.
2. LCD Display Window - Text interface for the storage unit electronic settings. See page 13 for complete listing of all display menus and functions.
3. First Menu Select Button - This is used to select various control menus and to make changes in programming as shown by the text which appears above the button.
4. Second Menu Select Button - This is used to select various control menus and to make changes in programming as shown by the text which appears above the button.
5. Third Menu Select Button - This is used to select various control menus and to make changes in programming as shown by the text which appears above the button.
6. Fourth Menu Select Button - This is used to select various control menus and to make changes in programming as shown by the text which appears above the button.
7. Scroll "Down" Button - Scrolls to lower numbers when programming electronics.
8. Scroll "Up" Button - Scrolls to higher numbers when programming electronics.
9. "Program / Lock" Key Switch - Switches the controller between the Standard Operating Mode and the Program Mode. Also protects electronic programming from being changed by unauthorized personnel.

SERIES 2301 CONTROLLER SIDE PANEL



SERIES 2301 CONTROLLER SIDE PANEL

	Part Number
1. Ethernet Port- The Ethernet Cord for future expansion.	5639-E601
2. RS-485 IN- Used for RS-485 Cryomonitor communication between controllers.	5640-E601
3. RS-485 OUT - Used for RS-485 Cryomonitor communication between controllers.	5640-E601
4. Thermal Printer Port - Used for printing alarms & data.	5649-E601
5. AUX RS 485 - RS-485 communications port for future expansion.	5648-E601
6. USB Port - Used for Cryomonitor communications with PC.	5601-E608
7. 16 Port Connector -	5601-E069
- See voltage requirements on the controller.	
• 0-5V Outputs - For Temp. A, Temp B. and Level. (see page 11)	
• 4-20mA Outputs - For Temp A., Temp B. and Level. (see page 11)	
• SEQ/OFAF Input and Output Connection - For communication between controllers. (see page 10)	
8. 24 V Power Supply - This is the main power supply cord to the unit, be sure to check for proper voltage	5650-E601
9. 2 Amp Fuse - VAC 2 amp buss fuse; 220 volts slow-blow. (T2A-250V)	5647-E601
10. Global Remote Alarm - Dry contact that switches status when any alarm occurs. (see page 12)	5646-E601
11. Power Supply Bracket	5601-E002

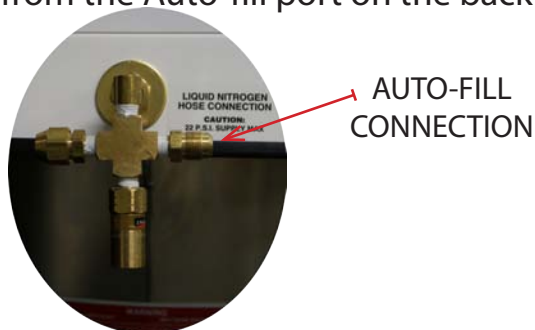
V SERIES CAROUSEL MANUAL FILL INSTRUCTIONS

The unique design of the new Isothermal Storage Unit is such that it is no longer necessary to fill the storage chamber with liquid nitrogen. Instead, the inner walls of the storage vessel are filled with liquid nitrogen and the sample storage chamber holds no liquid at all. Because of this unique design, the manual filling of this equipment is very different from storage units of the past. Use the following instructions to manually fill the Isothermal Carousel Storage unit in the event of a power outage or if the auto-fill is not working properly.

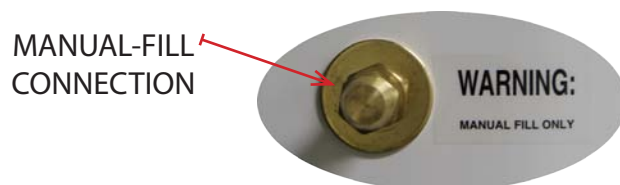
IMPORTANT: It is not recommended to attempt to manually fill the Isothermal Carousel Storage Unit by opening the lid and placing a fill line over the edge into the vessel. This is an incorrect fill method and will cause liquid nitrogen to come in contact with the stored samples.

For the correct manual filling of the Isothermal unit perform the following steps:

1. Turn off the liquid nitrogen supply valve at the supply tank.
2. Disconnect the supply line from the Auto-fill port on the back of the unit.



3. Remove the cap from the manual fill port, also on the back of the unit.



4. Place the cap on the auto-fill port where the supply line was connected, and tighten down.
5. Connect the liquid nitrogen supply line to the manual fill port, and tighten down.

CAUTION: Before opening the supply valve to fill the Isothermal Carousel Unit, read the following text (SEE PAGE 9a) to learn how to gauge the liquid level, so the Storage Unit does not overfill and create hazardous conditions.

V SERIES CAROUSEL MANUAL FILL INSTRUCTIONS

Without power there will be no digital display to give the liquid level, and the liquid cannot be seen visually since it is contained inside the walls of the Isothermal Unit. Thus the lid must remain open during the manual fill process. With this in mind, the best way to gauge the fill level is when the tank is nearing maximum fill, liquid nitrogen will begin to “spray” from the vents located near the top edge of the inner walls of the vessel. When this is seen, the supply valve should be shut off immediately before excessive amounts of liquid nitrogen begin to spill into the storage space.



Check unit daily to ensure proper operation and safety of the stored samples. For the V Series units it is essential to lift the lid each day and check for vapor and signs of proper freezing.

FEATURE DETAILS

SEQ/OFAF system: (See page 16 screen # 7)

SEQUENTIAL MODE (recommended):

- Connect all 2301 controllers to your LN2 supply source.
- Select "Sequential" mode to maintain optimum fill pressure and significantly reduce LN2 transfer loss.
- Once the first controller reaches its High Level Set Point, it will activate the next controller. This process will continue until all linked controllers have reached their High Level Set Point sequentially.

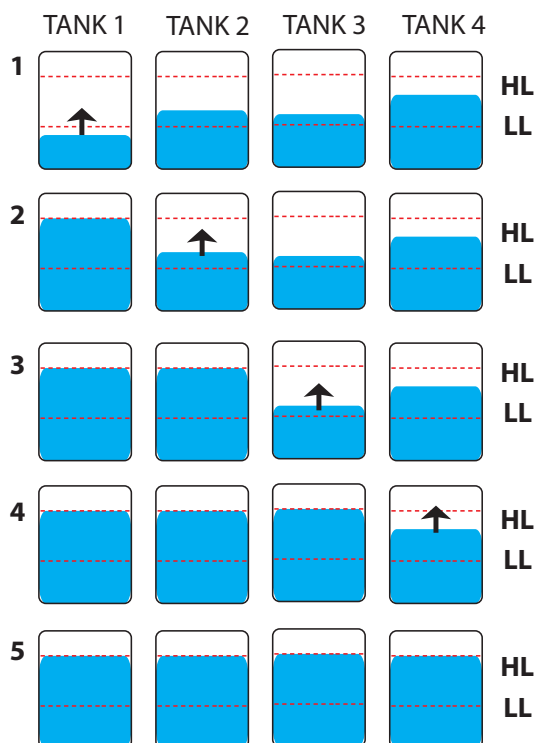
SIMULTANEOUS MODE:

- Connect all 2301 controllers to your LN2 supply source.
- Select "Simultaneous" mode.
- All freezers will begin to fill at the same time until all linked controllers have reached their High Level Set Point simultaneously.

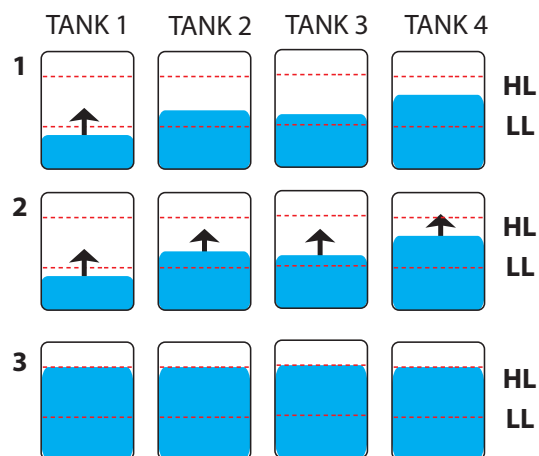
Custom Biogenic Systems recommends selecting "Sequential". This mode allows freezers to fill one at a time with a primed and cold supply system making it easier to maintain proper filling pressure and reducing LN2 transfer loss. This is more efficient than a keep cold system.

For best results with large pipeline LN2 supply systems, adjustment to the source alarm timer may be required. Please contact Custom Biogenic Systems with any questions regarding the function and setup of the SEQ/OFAF feature. In the event of an alarm status that stops the freezer from reaching the High Level Set Point, the 2301 controller will not trigger the next freezer in line to fill. However the auto fill function always takes priority over the SEQ/OFAF settings.

SEQUENTIAL FILL



SIMULTANEOUS FILL



FEATURE DETAILS

Fill Timer: (See page 16 screen #6)

Enables setting the timer to fill the freezer at 24, 48 or 72 hour intervals at the time selected. Note that the Auto Fill setting will always override the Fill Timer setting.

Lid Temperature Display:

- Lid Temperature A Thermocouple is located approximately 11" from the top of the tank.
- Lid Temperature B Thermocouple is located approximately 20" from the top of the tank.

0-5Vdc & 4-20mA Outputs:

Easy screw terminal output connections for existing alarm and monitoring systems. This feature is available through the Tank ID menu (See page 16 screen # 4). Select either:

- 0-5Vdc with connections to Temp-A, Temp-B and Level
- 4-20mA with connections to Temp-A, Temp-B and Level

Fill/Vent In Progress:

Signal to activate the Custom Biogenic Systems TS-1B LN2 supply tank switcher or an additional 24Vdc valve to control the LN2 supply.

Report Log Feature: (See page 15 screen #99)

- Alarms – Records Sequence of events such as POWER ON, etc...
- Data –The LOG function is enabled for use with either Cryomonitor or Reporting. This will Date/Time stamp Temp-A, Temp-B and Level at the programmable rate of 1-90 hours on the hour. This information is selected by date range to either be displayed or printed for easy review.

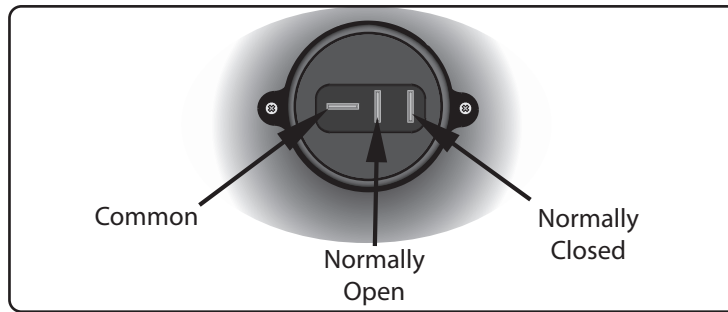
Optional Features**Overflow Sensor:** (Not included as standard equipment, can be purchased separately)

This feature uses a thermister set at the bottom of the storage space along the probe holder tube. If an overflow occurs it will cause the LN2 to make contact with the thermister. An audible and visual alarm will occur and "SYSTEM STATUS: ALARM ** LN2 OVERFLOW **" will appear on the display and power to all solenoid valves will be disabled.

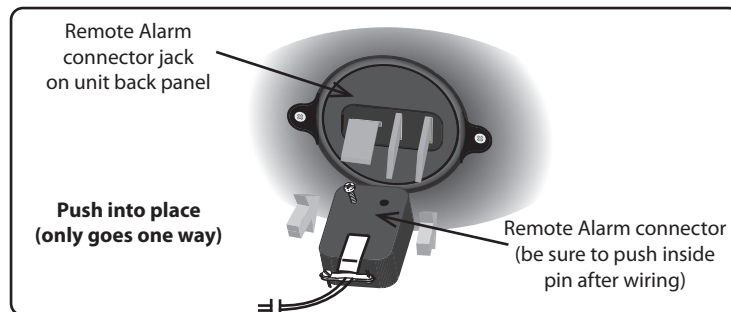
REMOTE ALARM WIRING

Locate the Remote Alarm Connector on the controller (#10 on page 7&8). This is where the remote alarm or auto dialer will plug into the control unit.

REMOTE ALARM CONNECTOR
Diagram shows connections for wiring arrangement.



First, wires from the remote alarm or auto dialer must be connected to the plug-end which plugs into the Remote Alarm Connector. Use the diagram to connect wires from the remote unit.



When unit goes into an alarm condition or loses power, the contacts will switch their "Open" or "Closed" state to be the opposite of when there was not an alarm condition, thereby sending a signal to the remote alarm or auto dialer. Wiring it to common and normally open will trigger the remote contact if a power failure occurs

STORAGE UNIT PARAMETERS

Cooling medium: **Liquid nitrogen only** (supplied by a pressurized cryogenic transport vessel)

Operating Pressure: **22 p.s.i.**

IMPORTANT: Normal operating pressure is 25 p.s.i. max/ 20 p.s.i. min (22p.s.i. recommended) if the pressure is greater or less than, the efficiency of your liquid nitrogen storage unit could be affected. This could be noticeable in ways such as increased liquid use, level and source

Power Supply Voltage: **120 Volts AC 60 Hz standard - 220 Volts AC 60/50 Hz optional**

Amperage: **2 amp max**

Fuse: **VAC 2 amp Buss fuse; 220 volts slow-blow. (T2A 250V)** (automotive glass tube type fuse)

Specification:	V3000-AB/C	V3000EH-AB/C
LN2 Capacity (Liters)	70	89
Static Holding Time (Days)	8	9
<i>External Dimensions</i>		
Width (in/mm)	37 (940)	37 (940)
Depth (in/mm)	48 (1,219)	48 (1,219)
Height (in/mm)	44.5 (1,130)	54.5 (1,384)
Usable Interior Height (in/mm)	27 (686)	35 (889)
Usable Interior Diameter (in/mm)	29 (737)	29 (737)
Weight Empty (lbs/kg)	600 (272)	636 (288)
Weight Full (lbs/kg)	720 (327)	795 (361)
Maximum Vial Capacity (2mL)	18,000	22,500
Maximum Blood Bag Capacity (50mL)	852	1,136

Operating levels for LN₂: **Extra High Series: 0 to 28 inches** (higher fill heights may be used, call CBS for more info)

V Series Models: 23 inches

LCD DISPLAY FUNCTIONS

This section shows each display window and gives important information necessary for understanding and operating the LCD text functions of the 2301 Controller.

To start, the index below shows where in this section to find each and every function of the controller. This will enable the user to correctly program all functions of the storage unit to meet their individual needs.

The overall operation consists of two basic modes: the Standard Operating Mode, and the Program Mode. The unit is in the Standard Operating Mode when the Program/Lock key switch on the front panel (Page 6, number 9) is turned to **Lock**. To enter the Program Mode, the key must be inserted and the switch turned to **Program**.

In the Standard Operating Mode, there are 6 different displays possible. They are as follows:

Standard Display - Display number 1 - page 14

Standard Display While Unit is Filling - Display number 2 - page 14

Standard Display With Lid Open - Display number 3 - page 15

Alarm Condition Display - Display number 90 - page 15

Alarm Condition Display With Audible Alarm Muted - Display number 91 - page 15

Printing Report - Display number 99 - page 15

The Alarm Condition display will give the specific cause of each alarm condition that may be occurring. The following is a list of the possible alarm conditions:

Low Alarm	Open Fill
High Alarm	Open Bypass
Source Alarm	Temp. A Probe
Temp. A High	Temp. B Probe
Temp. B High	Open BP Probe
Thermistor Open	LN2 Overflow "Optional" Additional Equipment Required

In the Program Mode, there are various displays possible. The following is a list of programming functions and the corresponding display windows. For each of these programming functions, there may be sub-menus that follow the primary display window. The sub-menus are not listed here, but are shown and explained following the primary windows. The primary programming functions are as follows:

Main Menu - Display number 4 - page 16 Provides access to:

Date/Time Settings - Display number 8 - page 17

Tank ID Settings - Display number 13 - page 18

Liquid Level Settings - Display number 15 - page 18

Main Menu 2 - Display number 5 - page 16 Provides access to:

Temp Settings - Display number 19 - page 18

Printer Functions - Display number 22 - page 19

Bypass Settings - Display number 24 - page 19

Main Menu 3 - Display number 6 - page 16 Provides access to:

Control Validation - Display number 40 - page 20

Fill Timer Settings - Display number 7A - page 17

Software Revision level - Display number 42 - page 23

Main Menu 4 - Display number 7 - Page 16 Provides access to:

One Fill All Fill - Display #44 on page 24

Log - Display #45 on Page 23

Return to Main Menu - Display #4 on page 16

LCD DISPLAY FUNCTIONS

Using The Diagrams to Understand the Display Functions

WARNING: NEVER USE AN OBJECT OTHER THAN YOUR FINGER TO PRESS THESE BUTTONS. DOING SO WILL RESULT IN PERMANENT DAMAGE TO THE CONTROLLER OVERLAY.

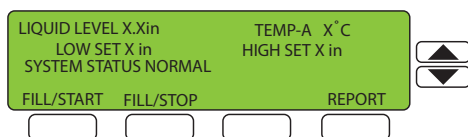
Below is a sample display window as they're shown in the following section. Use the diagram to become familiar with the way this section is organized, and how the information is presented in reference to each display window and it's functions. (NOTE: Tolerance on Liquid Level Display is +/- 1" (2.54cm) and The Tolerance on the Temperature display is +/- 1°C)

SAMPLE DISPLAY WINDOW

X's ARE USED IN PLACE OF NUMBERS IN THE DISPLAY WINDOW, SINCE THE ACTUAL NUMBERS WILL VARY.

THIS NUMBER TO THE LEFT OF EACH WINDOW IS A GENERAL IDENTIFICATION NUMBER USED TO ORGANIZE THE DISPLAYS FOR THIS MANUAL. THIS NUMBER WILL NOT APPEAR ANYWHERE ON THE CONTROLLER OR THE ACTUAL DISPLAY WINDOWS

#1



Press this button to begin a manual fill

Press this button to advance to display #99 (see page 15) and print report (see page 19)

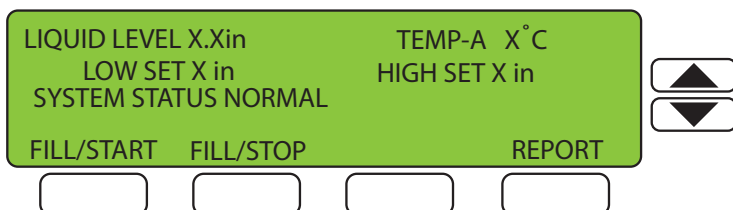
THE TEXT BELOW THE BUTTONS EXPLAINS THE FUNCTION OF EACH OF THE BUTTONS. ALSO TELLS WHICH DISPLAY THE BUTTON WILL ADVANCE TO, AND THE PAGE NUMBER WHERE IT CAN BE FOUND IN THE INSTRUCTION MANUAL

This is the standard display which will appear during normal operation under most circumstances.

THE TEXT TO THE RIGHT OF THE DISPLAY EXPLAINS THE SPECIFICS OF THE DISPLAY MESSAGE AND WHY IT IS OCCURRING

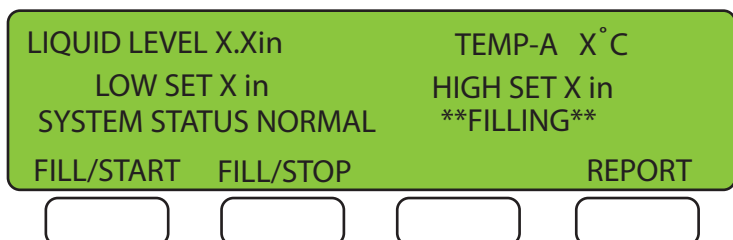
Standard Operating Mode Display Windows

#1



This is the standard display which will appear during normal operation under most circumstances.
NOTE: Use Up/Down arrows to toggle display between Temp. A and Temp. B

#2

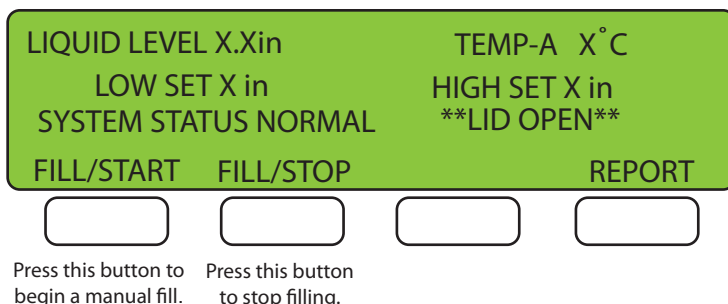


This display will appear during normal operation when either a manual or automatic fill is occurring.

LCD DISPLAY FUNCTIONS

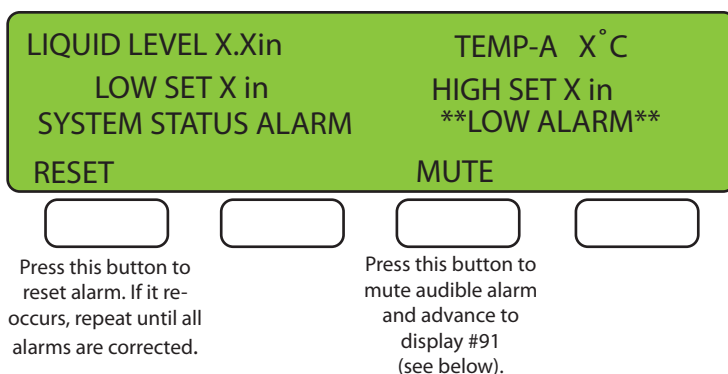
Standard Operating Mode Display Windows

#3



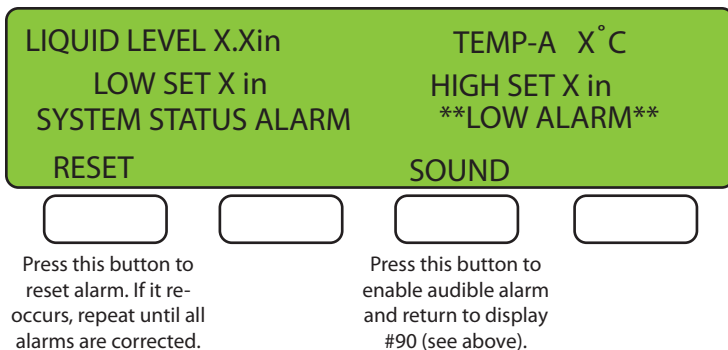
This display will appear during normal operation when the lid is opened.

#90



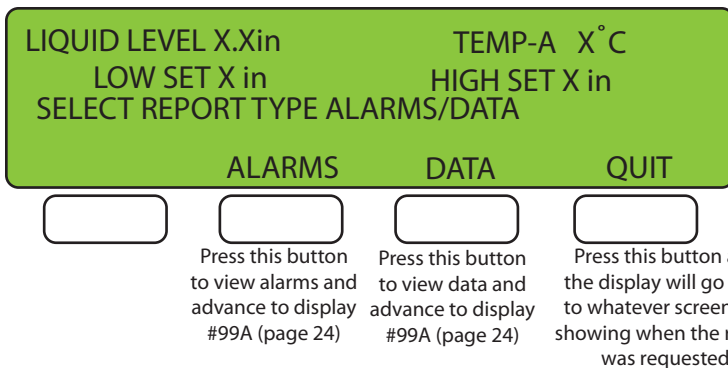
This display will appear when an alarm condition is occurring. The specific nature of the alarm will be shown in line 3 of the display text. The **ALARM** will flash on and off in one second intervals. ("LOW ALARM" is shown only as an example of the alarm display window. See page 13 for a complete list of alarms.)

#91



This display will appear when an alarm condition is occurring AND the audible alarm is muted. ("LOW ALARM" is shown only as an example of the alarm display window. See page 13 for a complete list of alarms.)

#99

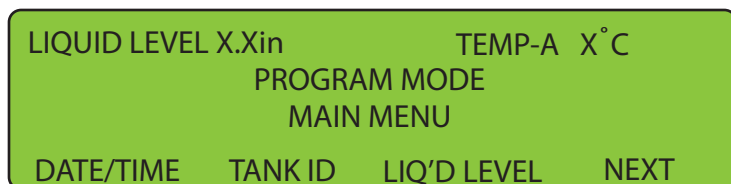


This display will appear during normal operation when "REPORT" is selected from displays 1, 2, or 3.

LCD DISPLAY FUNCTIONS

Program Mode Display Windows

#4



Press this button to advance to display #8: DATE/TIME settings. (see page 17)

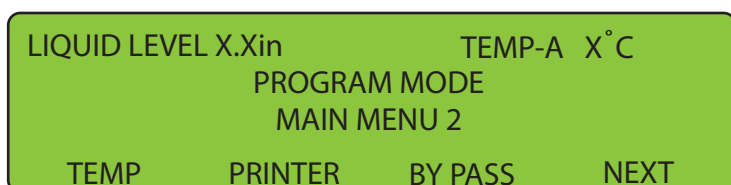
Press this button to advance to display #13 TANK ID settings. (see page 17)

Press this button to advance to display #15: LIQUID LEVEL settings. (see page 18)

Press this button to advance to display #5: MAIN MENU 2. (see below)

This display will appear when the PROGRAM/LOCK switch is turned to PROGRAM.

#5



Press this button to advance to display #19: LID TEMP settings. (see page 18)

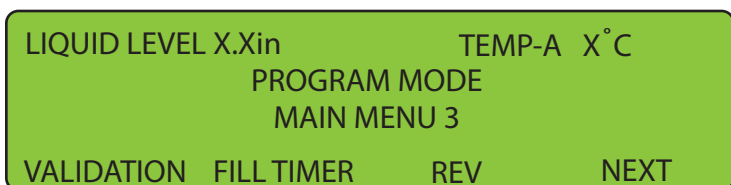
Press this button to advance to display #22: REPORT settings. (see page 19)

Press this button to advance to display #24: BYPASS settings. (see page 19)

Press this button to advance to display #6: MAIN MENU 3. (see below)

This display will appear when "NEXT" is selected on display #4.

#6



Press this button to advance to display #40: VALIDATION settings. (see page 19)

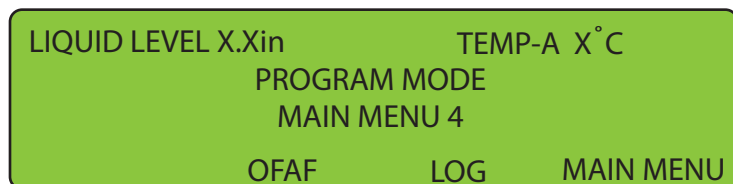
Press this button to advance to display #7A: FILL TIMER settings. (see below)

Press this button to advance to display #42: REVISION parameters. (see page 22)

Press this button to return to display #4: MAIN MENU. (see above)

This display will appear when "NEXT" is selected on display #5.

#7



Press this button to advance to Display #44 (see page 24)

Press this button to advance to screen #45 (see page 25)

Press this button to end operation and return to display #4: MAIN MENU (see above)

This display will appear when "NEXT" is selected on display #6.

LCD DISPLAY FUNCTIONS

Program Mode Display Windows

#7A

LIQUID LEVEL X.Xin		TEMP-A X°C	
PROGRAM MODE			
FILL TIMER IS CURRENTLY: DISABLED			
ENABLE	DISABLE	MAIN MENU	
<input type="button"/>	<input type="button"/>	<input type="button"/>	<input type="button"/>

Press this button to
ENABLE Fill Timer
this will advance
you to display
#7B (below)

Press this button to
DISABLE Fill Timer
this will return you
to display #6
Main Menu 3
(see page 16)

This display will appear when "FILL
TIMER" is selected on display #6.
This is a prompt to ENABLE or DISABLE
the Automatic Fill Timer. The Fill Timer
gives the option of an automatic fill
every 24, 48, or 72 hours at a specified
time of day. These settings are
programmed in the 2 menus that follow.

#7B

LIQUID LEVEL X.Xin		TEMP-A X°C	
PROGRAM MODE			
SELECT INTERVAL FOR FILL TIMER			
24 HOURS	48 HOURS	72 HOURS	MAIN MENU
<input type="button"/>	<input type="button"/>	<input type="button"/>	<input type="button"/>

Press this button to
select a 24 hour time
interval and advance
to display #7C. (below)

Press this button to
select a 48 hour time
interval and advance
to display #7C. (below)

Press this button to
select a 72 hour
time interval and
advance to display
#7C. (below)

Press this button to
discard changes and
return to display #6:
MAIN MENU 3
(see page 16)

This display will appear when
"ENABLE" is selected on display #7A.
Use this menu to set the time interval
that the automatic fill will occur.

#7C

LIQUID LEVEL X.Xin		TEMP-A X°C	
PROGRAM MODE			
SELECT TIME TO START FILL ??:??			
ENTER	HR<->MIN	MAIN MENU	
<input type="button"/>	<input type="button"/>	<input type="button"/>	<input type="button"/>

Press this button to
advance to display
#16: Main Menu 3
(see page 16)

Press this button to
move the cursor
between
Hours and Minutes

Press this button to
advance to display
#6: MAIN MENU 3.
(see page 16)

These arrows
adjust value

▲
▼

This display will appear
when any time interval is
selected on display #7B.
Use this menu to set
the time of day that the
automatic fill will occur.

#8

LIQUID LEVEL X.Xin		TEMP-A X°C	
PROGRAM MODE			
CURRENT DATE/TIME: XX/XX/XX XX:XX:XX			
		MAIN MENU	
<input type="button"/>	<input type="button"/>	<input type="button"/>	<input type="button"/>

Press this button to
move cursor left.

Press this button to
move cursor right.

Press this button to
return to display
#4: MAIN MENU
(see page 16)

These arrows
adjust value

▲
▼

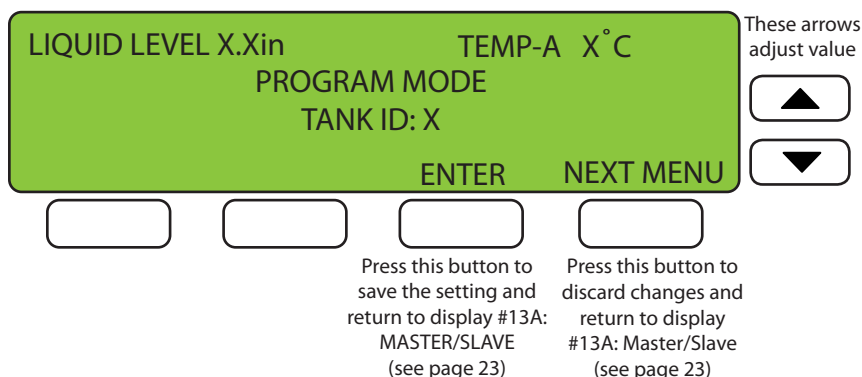
This display will appear when
"DATE/TIME" is selected on
display #4. Use this menu to
change the date and time
settings.

NOTE:
DAY/MONTH/YEAR

LCD DISPLAY FUNCTIONS

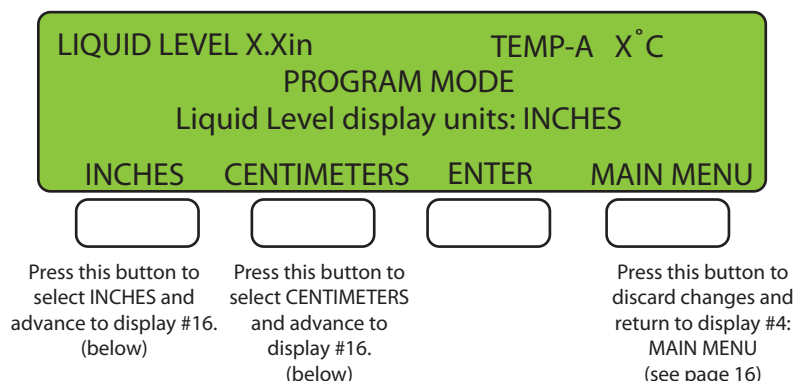
Program Mode Display Windows

#13



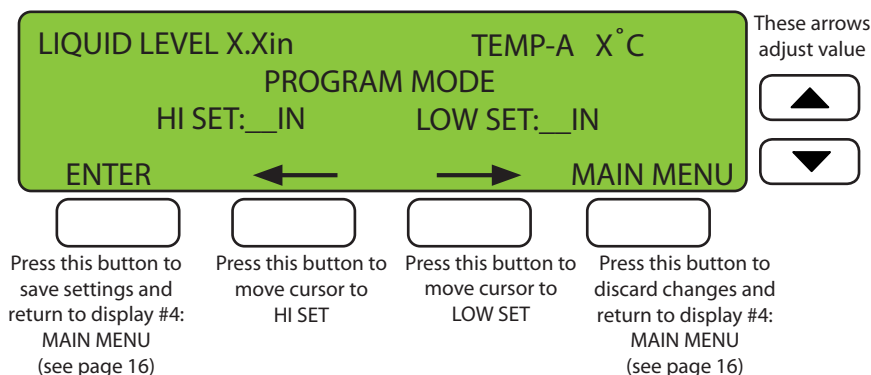
This display will appear when "TANK ID" is selected on display #4. The Tank ID is necessary when using the CryoMonitor computer interface software.

#15



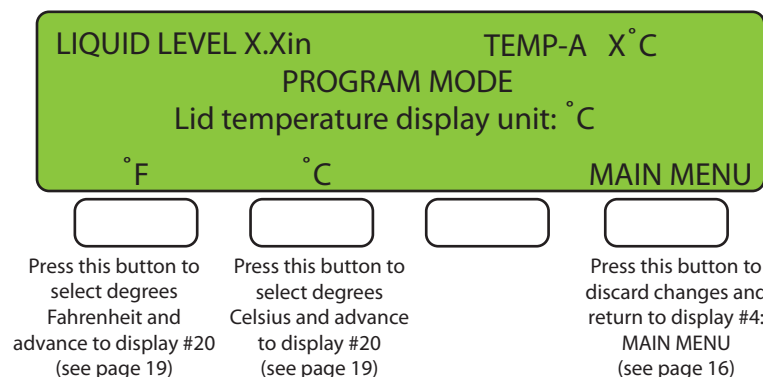
This display will appear when "LIQ'D LEVEL" is selected on display #4. Use this menu to select measurement preferences for the liquid level settings, i.e. inches or cm.

#16



This display will appear when "INCHES" or "CENTIMETERS" is selected on display #15. Use this menu to select HI and LOW liquid level settings.

#19



This display will appear when "TEMP" is selected on display #5. Use this menu to select temperature preferences, i.e. °F or °C.

LCD DISPLAY FUNCTIONS

Program Mode Display Windows

#20

LIQUID LEVEL X.Xin TEMP-A X°C
PROGRAM MODE
TEMP. A ALARM: XXX°C

ENTER MAIN MENU

Press this button to save changes and advance to display #21 (see below)

Press this button to discard changes and return to display #4: MAIN MENU (see page 16)

These arrows adjust value

This display will appear when "°F" or "°C" is selected on display #19. Use this menu to select a temperature for the Temp. A. Alarm to be activated.

#21

LIQUID LEVEL X.Xin TEMP-A X°C
PROGRAM MODE
TEMP. B ALARM: XXX°C

ENTER MAIN MENU

Press this button to save the setting and Return to display #4 Main Menu (see page 16)

Press this button to discard changes and return to display #4: MAIN MENU (see page 16)

These arrows adjust settings

This display will appear when "°F" or "°C" is selected on display #19. Use this menu to select a temperature for the Temp. B. Alarm to be activated.

#22

LIQUID LEVEL X.Xin TEMP-A X°C
PROGRAM MODE
PRINT TEMP. EVERY --

ENTER MAIN MENU

Press this button to save changes and advance to display #23 (below)

Press this button to discard changes and return to display #5: MAIN MENU 2 (see page 16)

These arrows adjust value

This display will appear when "REPORT" is selected on display #5. Use this menu to select the time interval between temperature reports. **NOTE:** A value of "--" means temp. report printing is disabled. For use with thermal printer only.

#23

LIQUID LEVEL X.Xin TEMP-A X°C
PROGRAM MODE
PRINT REPORT EVERY --

PRINT NOW ENTER MAIN MENU

Press this button to print report instantly.

Press this button to save changes and return to display #5: MAIN MENU 2 (see page 16)

Press this button to discard changes and return to display #5: MAIN MENU 2 (see page 16)

These arrows adjust value

This display will appear when "ENTER" is selected on display #22. Use this menu to select number of days between temperature reports. **NOTE:** A value of "--" means temp. report printing is disabled. For use with thermal printer only.

LCD DISPLAY FUNCTIONS

Program Mode Display Windows

#24

LIQUID LEVEL X.Xin	TEMP-A X°C
PROGRAM MODE	
By Pass option currently: OFF	
ON	MAIN MENU

Press this button to change current setting and return to display #4: MAIN MENU (see page 16)

Press this button to maintain current setting and return to display #4: MAIN MENU (see page 16)

This display will appear when "BYPASS" is selected on display #5.

This menu is a prompt to enable or disable the Bypass Option.

#40

LIQUID LEVEL X.Xin	TEMP-A X°C
PROGRAM MODE	
Testing: OVERLAY BUTTONS	
BEGIN	SKIP

Press this button to begin testing the overlay buttons, and advance to display #41, and begin the final test. (see below)

Press this button to skip test and advance to display #41 (see below)

This display will appear when "VALIDATION" is selected on display #6. This menu begins the testing of the overlay buttons. Select "BEGIN" to proceed or "SKIP" to advance to the next window of the validation process.

#41

LIQUID LEVEL X.Xin	TEMP-A X°C		
CONTROL VALIDATION			
Testing: BUZZER			
TEST	PASS	FAIL	SKIP

Press this button to test audible alarm. Buzzer should sound.

Press this button if test passes, to advance to display #41A, and next test. (below)

Press this button if test fails, to advance to display #41A, and next test. (below)

Press this button to skip test, advance to display #41A, and next test. (below)

This display will appear when "SKIP" is selected on display #40 or upon completion of testing the overlay buttons. This menu tests the audible alarm. This is the first in a series of test menus which will appear in sequence when "PASS", "FAIL", or "SKIP" is selected for each function being tested.

#41A

LIQUID LEVEL X.Xin	TEMP-A X°C		
CONTROL VALIDATION			
Testing: REMOTE CONTACTS			
TEST	PASS	FAIL	SKIP

Press this button to toggle remote alarm contacts.

Press this button if test passes, to advance to display #41B, and next test. (see page 21)

Press this button if test passes, to advance to display #41B, and next test. (see page 21)

Press this button to skip test, advance to display #41B, and next test. (see page 21)

This display will appear when "PASS", "FAIL", or "SKIP" is selected on display #40. This menu tests remote alarm contacts. Controller advances to next test when "PASS", "FAIL", or "SKIP" is selected.

LCD DISPLAY FUNCTIONS

Program Mode Display Windows

#41B

LIQUID LEVEL X.Xin		TEMP-A X°C	
CONTROL VALIDATION			
Testing: LID TEMPERATURE-A			
PASS	FAIL	SKIP	
<input type="button" value="PASS"/>	<input type="button" value="FAIL"/>	<input type="button" value="SKIP"/>	<input type="button" value="SKIP"/>
Press this button if test passes, to advance to display #41B-2, and next test. (below)	Press this button if test fails, to advance to display #41B-2, and next test. (below)	Press this button to skip test, advance to display #41B-2, and next test. (below)	

This display will appear when "PASS", "FAIL", or "SKIP" is selected on display #41A. This menu is for testing the lid temperature. Controller advances to next test when "PASS", "FAIL", or "SKIP" is selected.

#41B-2

LIQUID LEVEL X.Xin		TEMP-B X°C	
CONTROL VALIDATION			
Testing: LID TEMPERATURE-B			
PASS	FAIL	SKIP	
<input type="button" value="PASS"/>	<input type="button" value="FAIL"/>	<input type="button" value="SKIP"/>	<input type="button" value="SKIP"/>
Press this button if test passes, to advance to display #41C, and next test. (below)	Press this button if test fails, to advance to display #41C, and next test. (below)	Press this button to skip test, advance to display #41C, and next test. (below)	

This display will appear when "PASS", "FAIL", or "SKIP" is selected on display #41B. This menu is for testing the lid temperature. Controller advances to next test when "PASS", "FAIL", or "SKIP" is selected.

#41C

LIQUID LEVEL X.Xin		TEMP-A X°C	
CONTROL VALIDATION			
Vent Temperature is: XX°C			
PASS	FAIL	SKIP	
<input type="button" value="PASS"/>	<input type="button" value="FAIL"/>	<input type="button" value="SKIP"/>	<input type="button" value="SKIP"/>
Press this button if test passes, to advance to display #41D, and next test. (below)	Press this button if test fails, to advance to display #41D, and next test. (below)	Press this button to skip test, advance to display #41D, and next test. (below)	

This display will appear when "PASS", "FAIL", or "SKIP" is selected on display #41B-2. This menu displays current vent temperature. Controller advances to next test when "PASS", "FAIL", or "SKIP" is selected.

#41D

LIQUID LEVEL X.Xin		TEMP-A X°C	
CONTROL VALIDATION			
Testing: PRINTER			
TEST	PASS	FAIL	SKIP
<input type="button" value="TEST"/>	<input type="button" value="PASS"/>	<input type="button" value="FAIL"/>	<input type="button" value="SKIP"/>
Press this button to send "TESTING PRINTER" to the printer.	Press this button if test passes, to advance to display #41E, and next test. (see page 22)	Press this button if test fails, to advance to display #41E, and next test. (see page 22)	Press this button to skip test, advance to display #41E, and next test. (see page 22)

This display will appear when "PASS", "FAIL", or "SKIP" is selected on display #41C. This menu tests printer. Controller advances to next test when "PASS", "FAIL", or "SKIP" is selected.

LCD DISPLAY FUNCTIONS

Program Mode Display Windows

#41E

LIQUID LEVEL X.Xin		TEMP-A X °C	
CONTROL VALIDATION			
Testing: BYPASS VALVE			
TEST	PASS	FAIL	SKIP
<input type="button"/>	<input type="button"/>	<input type="button"/>	<input type="button"/>
Press this button to activate the Bypass Valve for as long as the button is held.	Press this button if test passes, to advance to display #41F, and next test. (below)	Press this button if test fails, to advance to display #41F, and next test. (below)	Press this button to skip test, advance to display #41F, and next test. (below)

This display will appear when "PASS", "FAIL", or "SKIP" is selected on display #41D. This menu tests the fill valve. Controller advances to next test when "PASS", "FAIL", or "SKIP" is selected.

#41F

LIQUID LEVEL X.Xin		TEMP-A X °C	
CONTROL VALIDATION			
Testing: FILL VALVE			
TEST	PASS	FAIL	SKIP
<input type="button"/>	<input type="button"/>	<input type="button"/>	<input type="button"/>
Press this button to activate Fill Valve for as long as the button is held.	Press this button if test passes, to advance to display #41G, and next test. (below)	Press this button if test fails, to advance to display #41G, and next test. (below)	Press this button to skip test, advance to display #41G, and next test. (below)

This display will appear when "PASS", "FAIL", or "SKIP" is selected on display #41E. This menu tests the fill valve. Controller advances to next test when "PASS", "FAIL", or "SKIP" is selected.

#41G

LIQUID LEVEL X.Xin		TEMP-A X °C	
CONTROL VALIDATION			
Lid is now OPEN			
	PASS	FAIL	SKIP
<input type="button"/>	<input type="button"/>	<input type="button"/>	<input type="button"/>
	Press this button if test passes, to advance to display #41H, and next test. (below)	Press this button if test fails, to advance to display #41H, and next test. (below)	Press this button to skip test, advance to display #41H, and next test. (below)

This display will appear when "PASS", "FAIL", or "SKIP" is selected on display #41F. This menu tests the lid switch. With the lid closed, the display should read "LID IS NOW CLOSED", with the lid open, it should read "LID IS NOW OPEN". Controller advances to next test when "PASS", "FAIL", or "SKIP" is selected.

#41H

LIQUID LEVEL X.Xin		TEMP-A X °C	
CONTROL VALIDATION			
Print Test Results?			
YES		NO	
<input type="button"/>	<input type="button"/>	<input type="button"/>	<input type="button"/>
		Press this button to print test results and return to display #6: MAIN MENU 3. (see page 16)	Press this button to return to display #6: MAIN MENU 3. (see page 16)

This display will appear when the final test button is selected on display #41G, and when all tests have been completed or skipped. Use this menu to print test results if desired.

LCD DISPLAY FUNCTIONS

Program Mode Display Windows

#42

LIQUID LEVEL X.Xin TEMP-A X °C
PROGRAM MODE
S/W LABEL: C-CRYO1, REV-1.3,12-31-2009
MAIN MENU

Press this button to maintain current setting and return to display #4: MAIN MENU (see page 16)

This display will appear when you hit the REV button on display #6, on PAGE 16. Use this menu to view your revision number and date.

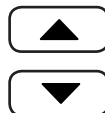
#13A

LIQUID LEVEL X.Xin TEMP-A X °C
PROGRAM MODE
MASTER/SLAVE: SLAVE
ENTER NEXT MENU

Press this button to save the setting and go to display #13C: OUTPUT SIGNAL TYPE (see below)

Press this button to discard changes and return to display #13B: Output Signal Type (see below)

These arrows adjust settings



This display will appear after a selection is made on screen #13 (see page 18).

NOTE: If this controller is connected to the PC it is to be set to master, if it is in the chain leading to the master it is to be set to slave.

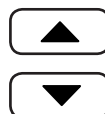
#13B

LIQUID LEVEL X.Xin TEMP-A X °C
PROGRAM MODE
OUTPUT SIGNAL TYPE: 4-20mA
ENTER MAIN MENU

Press this button to save changes and return to display #4: MAIN MENU (see page 16)

Press this button to discard changes and return to display #4: MAIN MENU (see page 16)

These arrows adjust settings



This display will appear after a selection is made on screen #13A (see above). Use this menu to activate either the 4-20mA outputs or the 0-5V outputs.

NOTE: Outputs are for use with an external monitoring system through the 16 port connector.

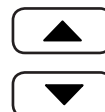
#45

LIQUID LEVEL X.Xin TEMP-A X °C
PROGRAM MODE
LOG DATA EVERY: --
ENTER MAIN MENU

Press this button to save the setting and Return to display #5 Main Menu 2 (see page 16)

Press this button to discard changes and return to display #5: MAIN MENU 2 (see page 16)

These arrows adjust settings



This display will appear when "LOG" is selected on display #7 (see page 16). This menu is used to choose how often you wish the data(Temp. A., Temp. B. and Level) to be recorded. The recorded info can be displayed/printed when the report function is selected from screens 1, 2, or 3.

LCD DISPLAY FUNCTIONS

Program Mode Display Windows

#44

LIQUID LEVEL X.Xin TEMP-A X °C
PROGRAM MODE
OFAF FUNCTION: OFF

OFF SIMULTANEOUS SEQUENTIAL MAIN MENU

Press this button to
disable OFAF and
return to display
#7A: MAIN MENU
(see page 16)

Press this button to
select Simultaneous
and Advance to
screen #46
(see page 25)

Press this button to
select Sequential
and Advance to
screen #46
(see page 25)

Press this button to
discard changes and
return to display #7A:
MAIN MENU
(see page 16)

This display will appear when OFAF is selected on display #7 (see page 16).

#99A

LIQUID LEVEL X.Xin TEMP-A X °C
LOW SET: XX IN HIGH SET: XX IN
ENTER REPORT START DATE: DD/MM/YY

QUIT ← → ENTER

Press this button to
return to whatever
screen was showing
when the report was
requested

Press this button to
discard changes and
return to display #4:
MAIN MENU
(see page 16)

This display will appear when either alarms or data is selected on display #99 (see page 15). Use this menu to select the start date that you want the alarm/data to begin on the report display or printout.

#99B

LIQUID LEVEL X.Xin TEMP-A X °C
LOW SET: XX IN HIGH SET: XX IN
ENTER REPORT END DATE: DD/MM/YY

QUIT ← → ENTER

Press this button to
return to whatever
screen was showing
when the report was
requested

Press this button to
discard changes and
return to display #4:
MAIN MENU
(see page 16)

This display will appear when enter is selected on display #99A (see above). Use this menu to select the end date that you want the alarm/data to end on the report display or printout.

#99C

LIQUID LEVEL X.Xin TEMP-A X °C
LOW SET: XX IN HIGH SET: XX IN
SELECT REPORT PRINT/DISPLAY?

QUIT PRINT DISPLAY

Press this button to
return to whatever
screen was showing
when the report was
requested

Press this button to
save the setting and
Return to display #4
Main Menu
(see page 16)

This display will appear when enter is selected on display #99B (see above). Use this menu to choose weatehr you want the report to be printed or displayed on the screen.

LCD DISPLAY FUNCTIONS

Program Mode Display Windows

#99D

LIQUID LEVEL X.Xin TEMP-A X °C
RECORD #: DD/MM/YY HR:MIN:SEC

"ALARM/DATA WILL CHANGE"

QUIT PREV NEXT

Press this button to return to whatever screen was showing when the report was requested

Press this button to scroll to the previous recorded event.

Press this button to scroll to the next recorded even

This display will appear when "DISPLAY" is selected on display #99C (see page 24). Use this menu to view either the "ALARMS" or "DATA" that was selected on screen #99 (see page15).

#46

LIQUID LEVEL X.Xin TEMP-A X °C
PROGRAM MODE
OFAF TIMER VALUE (HRS): XX

ENTER NEXT MENU

Press this button to save changes and advance to screen #47 (below)

Press this button to advance to screen #47 (below)

These arrows adjust settings



This display will appear when OFAF function is set to SIMULTANEOUS or SEQUENTIAL (see page 24 display #44) and the "ENTER" button was pressed.

Note: Factory settings should be kept, any questions please contact Custom BioGenic Systems.

#47

LIQUID LEVEL X.Xin TEMP-A X °C
PROGRAM MODE
OFAF SIGNAL ON DURATION(SEC): XX

ENTER MAIN MENU

Press this button to save the setting and Return to display #4 Main Menu (see page 16)

Press this button to discard changes and return to display #4: MAIN MENU (see page 16)

These arrows adjust settings



This display will appear after screen #46 (see above).

Note: Factory settings should be kept, any questions please contact Custom BioGenic Systems.

HIGH & LOW LEVEL ALARM AND TEMPERATURE DISPLAY VERIFICATION

The following section includes verification procedures for the High and Low Level Alarms, and the Temperature Display on the Isothermal Carousel Liquid Nitrogen Storage Units.

Low Level Alarm Verification

1. Using the manual valve on the liquid nitrogen supply tank, turn off the liquid supply.
2. Create a low level alarm condition. This is done by adjusting the level set-points above the actual liquid level. If necessary, refer to page 18, display #15, and #16.
Example: The liquid level is 6 inches. Adjust the high level set-point to 10, and the low level set-point to 8. This will cause the controller to go into an auto fill.
In 7 to 10 minutes, a low alarm should occur. This will be indicated by the ****LOW ALARM**** text flashing and the audible alarm sounding. The remote alarm output will activate also.
3. Return set-points to the desired settings.
4. Open manual valve on supply tank to resume normal operation.

High Level Alarm Verification

1. Create a high level alarm condition. This is done by adjusting the level set-points at least one inch below the actual liquid level. If necessary, refer to page 18, display #15, and #16.
Example: The liquid level is 6 inches. Adjust the low set-point to 2 and the high set-point to 4.
In 3 to 5 minutes, a high alarm should occur. This will be indicated by the ****HIGH ALARM**** text flashing and the audible alarm sounding. The remote alarm output will activate also.
2. Return set-points to the desired settings. Unit is now ready for normal operation.

If the alarm functions aren't occurring as described above, repeat the verification procedure. If one or both of the alarms are still not functioning properly, refer to the troubleshooting guide on page 36 for further instruction.

Temperature Display Verification

1. Open Carousel storage unit Access Panel and locate temperature sensing probes A and B.
2. Remove probe from protective sleeve.
3. Submerge the sensor probe into liquid nitrogen. The digital temperature display should read -195° to -196° degrees celsius.
4. Remove probe from liquid nitrogen and place tip of probe in an ice bath (mixture of ice and water), and wait 30 seconds. While the probe is submerged, the digital display should read -1° to +1° degrees celsius.
5. Return probe into its protective sleeve at the desired depth.
6. Close the Carousel storage unit Access Panel and resume normal operation.

Access Panel



If the temperature display doesn't operate as described, there may be a problem with the probe, or the probe connections. See the Troubleshooting Guide on page 36 for further information if a problem is detected.

2301 TEMPERATURE CALIBRATION

IMPORTANT: When calibrating you should always calibrate Zero “ice bath” first. Then make sure the probe end is dry before calibrating Span “Liquid Nitrogen” to avoid ice formation on the probe end during calibration.

TEMP PROBE A

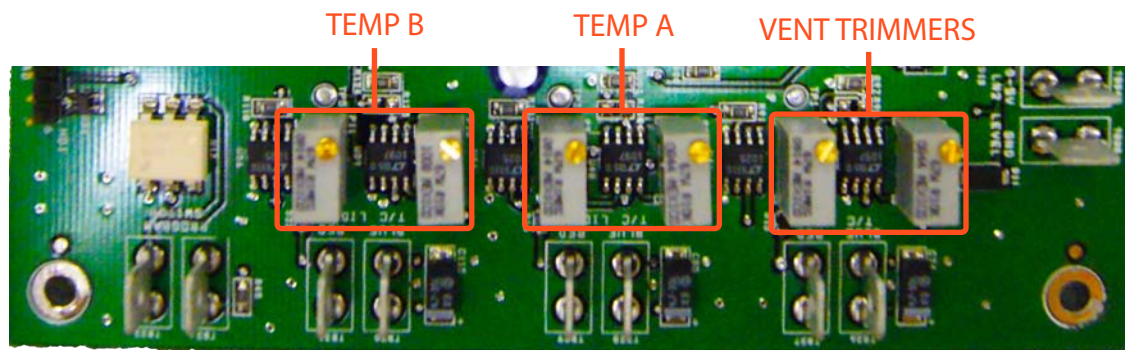
1. Satisfy alarm conditions so that the controller is in its normal operating state. Examples: Connect valves and thermocouples, set up low, high set points, and temperature alarm set point.
2. Place Temp A thermocouple probe in an Ice Bath and adjust trimmer P8 until display reads 0 deg. C. Clock wise adjusts temp. display down, Counter clockwise adjusts temp. display up.
3. Place Temp A thermocouple probe in Liquid Nitrogen and adjust trimmer P9 until display reads –196 deg. C. Clockwise adjusts temp. display down, Counter clockwise adjusts temp. display up.
4. Continue adjusting back and forth between steps 2 and 3 until temperature is correct on both ends, Zero and Span, without further adjustment. (Calibrate to +/- 1 degree)

TEMP PROBE B

1. Satisfy alarm conditions so that the controller is in its normal operating state. Examples: Connect valves and thermocouples, set up low, high set points, and temperature alarm set point.
2. Place Temp B thermocouple probe in an Ice Bath and adjust trimmer P10 until display reads 0 deg. C. Clock wise adjusts temp. display down, Counter clockwise adjusts temp. display up.
3. Place Temp B thermocouple probe in Liquid Nitrogen and adjust trimmer P11 until display reads –196 deg. C. Clockwise adjusts temp. display down, Counter clockwise adjusts temp. display up.
4. Continue adjusting back and forth between steps 2 and 3 until temperature is correct on both ends, Zero and Span, without further adjustment. (Calibrate to +/- 1 degree)

BYPASS TEMP

1. Satisfy alarm conditions so that the controller is in its normal operating state. Examples: Connect valves and thermocouples, set up low, high set points, and temperature alarm set point.
2. Place BYPASS thermocouple probe in an Ice Bath and adjust trimmer P6 until display reads 0 deg. C. Clock wise adjusts temp. display down, Counter clockwise adjusts temp. display up.
3. Place BYPASS thermocouple probe in Liquid Nitrogen and adjust trimmer P7 until display reads –196 deg. C. Clockwise adjusts temp. display down, Counter clockwise adjusts temp. display up.
4. Continue adjusting back and forth between steps 2 and 3 until temperature is correct on both ends, Zero and Span, without further adjustment. (Calibrate to +/- 1 degree)



Go to CustomBioGenics.com/technicalguides.html
for more information.

V SERIES CAROUSEL LIQUID LEVEL DISPLAY VERIFICATION & CALIBRATION

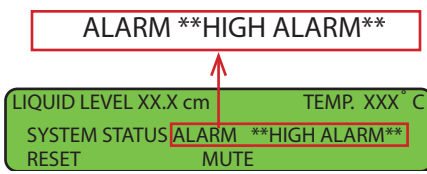
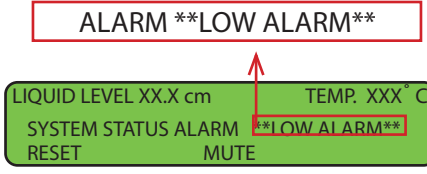
Since the V Series storage units hold LN2 in a jacketed space between the vacuum insulated space and storage chamber it cannot be calibrated the same as S Series storage units. Customers have multiple options to choose from in how they want to go about calibrating their Isothermal storage unit.


For all options below please call for pricing and further details:

N.I.S.T. traceable options:

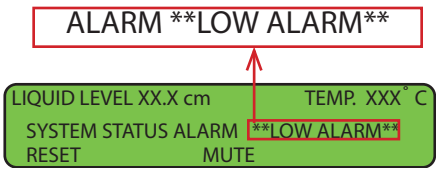
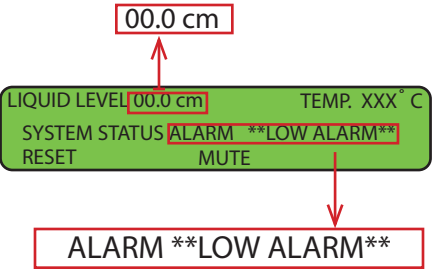
1. **Purchase Calibration Equipment**
2. **Rent Calibration Equipment**
3. **Have a qualified technician sent to your facility to perform the calibration**
4. **Return the controller to Custom Biogenic Systems to be calibrated**

TROUBLESHOOTING GUIDE: ALARMS

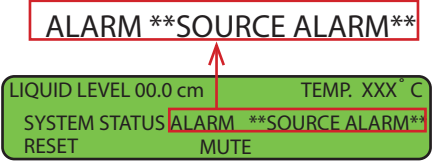
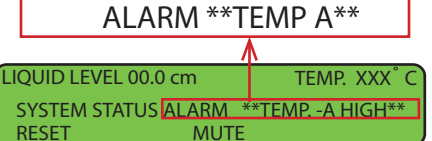
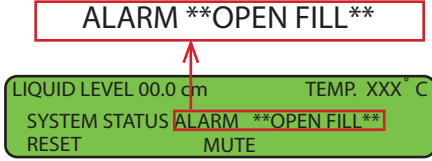
CONDITIONS	CAUSES	SOLUTIONS
<p>**HIGH ALARM** text is flashing and audible alarm is present.</p>  <p>*Liquid level in the vessel has risen above the HIGH level set-point.</p>	<ul style="list-style-type: none"> Check to see if unit is filling: -If unit is filling: -If unit is not filling: 	<ul style="list-style-type: none"> Push the STOP button, if fill continues, the solenoid valve may be frozen open; push the FILL and STOP buttons 15 to 20 times to un-stick the valve. If the fill continues, turn off the manual valve on the liquid nitrogen supply tank and let the solenoid valve warm to room temperature, then re-open the manual valve to see if proper operation returns. If not, the solenoid valve may need to be disassembled for service (see page 39 - <i>Cleaning and Maintenance</i>) There may be an obstruction in the solenoid valve. Remove solenoid valve and disassemble for service. (see page 39- <i>Cleaning and Maintenance</i>)
<p>**LOW ALARM** text is flashing and audible alarm is present.</p>  <p>*Liquid level in the vessel has fallen below the LOW level set-point.</p>	<ul style="list-style-type: none"> Supply tank is empty Supply tank is shut off Supply tank pressure is too low 3 or more storage units are filling at one time from a single supply line 	<ul style="list-style-type: none"> Replace supply tank Open manual valve on the supply tank Check pressure in supply tank - 25 p.s.i. maximum, 20 p.s.i. minimum (22 p.s.i. recommended) Storage vessels will fill very slowly and alarm will correct itself.

 Continued on next page

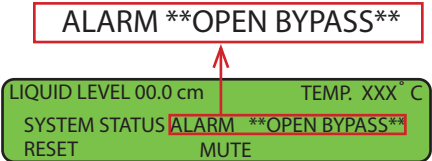
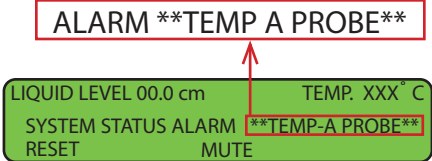
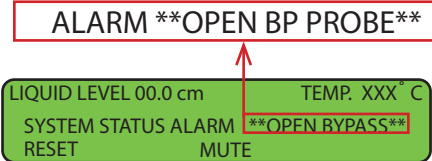
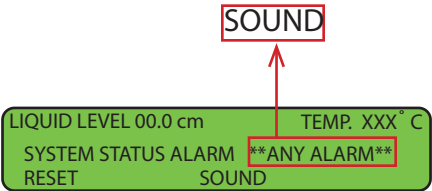

TROUBLESHOOTING GUIDE: ALARMS

CONDITIONS	CAUSES	SOLUTIONS
<p>**LOW ALARM** text is flashing and audible alarm is present.</p> 	<ul style="list-style-type: none"> ♦ Solenoid valve operating erratically 	<ul style="list-style-type: none"> ♦ Push STOP button briefly and listen for the fill solenoid valve to “click”. This sound is the valve operating. If the “click” is heard and the supply tank still has liquid and pressure in it, there may be an obstruction in the valve or in the line. <p>If no “click” is heard, check to see that the valve is plugged in, and/ or that there is power to the outlet which the valve is plugged into. If power is present at the valve, but the vessel is still not filling with liquid nitrogen, the valve may be defective.</p>
<p>**LOW ALARM** text is flashing, audible alarm is present, and level display reads “00.0 cm” (or “00.0 in”)</p> 	<ul style="list-style-type: none"> ♦ The LN² level in the vessel has fallen below the pressure sensing port. 	<ul style="list-style-type: none"> ♦ An automatic fill will begin, and when the liquid level rises above the LOW level setpoint and the pressure port, the alarm will subside. ♦ Check pressure hose at all connection points; a white clamp should be in place at each end of the hose inside the controller, and at the hose connection on the back of the controller. <p>If hose appears loose, disconnect it, remove an inch off the end by cutting it with scissors, and reconnect it. (If the vessel is holding liquid, it may take some time to read the corrected level.)</p>

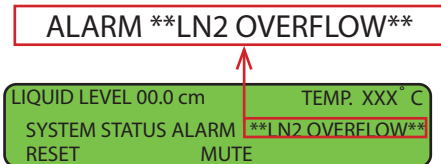
TROUBLESHOOTING GUIDE: ALARMS

CONDITIONS	CAUSES	SOLUTIONS
<p>**SOURCE** text is flashing and audible alarm is present.</p>  <p>*This indicates a weak or empty liquid supply.</p> <p>Liquid level is above the LOW level set-point, but isn't rising fast enough to satisfy the system.</p>	<ul style="list-style-type: none"> Supply tank is empty Supply tank is shut off Supply tank pressure is too low or too high 3 or more storage units are filling at one time from a single supply line 	<ul style="list-style-type: none"> Replace supply tank Open manual valve on supply tank if closed Check pressure in supply tank - 25 p.s.i. maximum, 20 p.s.i. minimum (22 p.s.i. recommended) Source alarms are not self correcting.
<p>**TEMP A** text is flashing and audible alarm is present.)</p>  <p>NOTE: Text may display "Temp B"</p>	<ul style="list-style-type: none"> Temperature has risen above set-point. Probe has been inadvertently moved. 	<ul style="list-style-type: none"> Lid has been open too long. Low liquid nitrogen level. Move probe to original location.
<p>**OPEN FILL** text is flashing and audible alarm is present</p> 	<ul style="list-style-type: none"> Fill valve disconnected from power source. Fill valve defective. 	<ul style="list-style-type: none"> Connect fill valve power cord correctly using diagram on page 7. Replace fill valve.

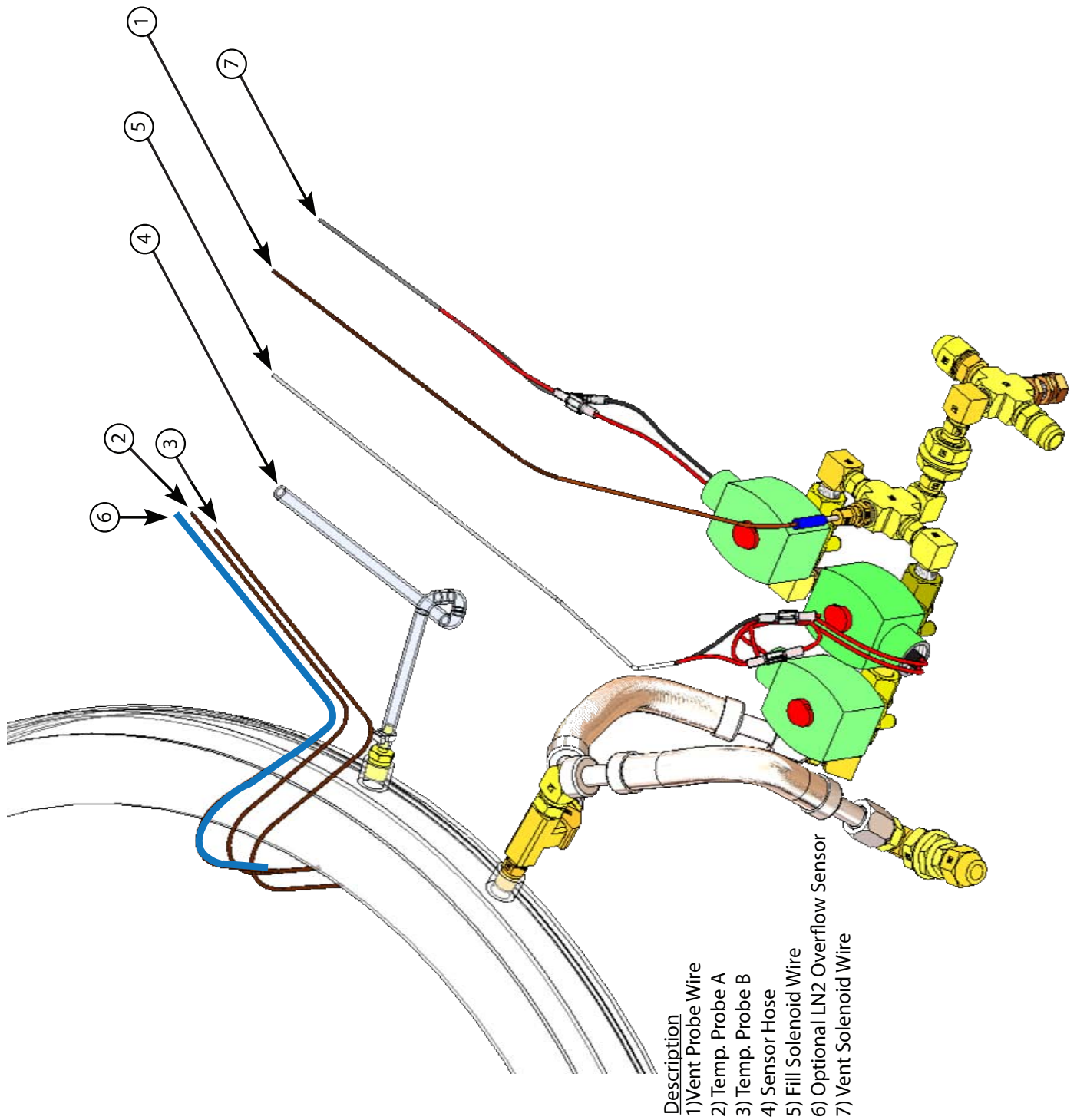
TROUBLESHOOTING GUIDE: ALARMS

CONDITIONS	CAUSES	SOLUTIONS
<p>**OPEN BYPASS** text is flashing and audible alarm is present.</p>  <p>LIQUID LEVEL 00.0 cm TEMP. XXX °C SYSTEM STATUS ALARM **OPEN BYPASS** RESET MUTE</p>	<ul style="list-style-type: none"> ♦ Bypass valve disconnected from power source. ♦ Bypass valve defective. 	<ul style="list-style-type: none"> ♦ Connect bypass valve power cord correctly using diagram on page 7. ♦ Replace bypass valve.
<p>**TEMP-A PROBE** text is flashing and audible alarm is present.</p>  <p>LIQUID LEVEL 00.0 cm TEMP. XXX °C SYSTEM STATUS ALARM **TEMP-A PROBE** RESET MUTE</p> <p>NOTE: Text may display "Temp B"</p>	<ul style="list-style-type: none"> ♦ Thermocouple probe plug is disconnected. ♦ Thermocouple probe is damaged. 	<ul style="list-style-type: none"> ♦ Connect probe plug properly using diagram on page 7. ♦ Replace damaged probe.
<p>**OPEN VENT PROBE** text is flashing and audible alarm is present.</p>  <p>LIQUID LEVEL 00.0 cm TEMP. XXX °C SYSTEM STATUS ALARM **OPEN BYPASS** RESET MUTE</p>	<ul style="list-style-type: none"> ♦ Thermocouple probe plug is disconnected. ♦ Thermocouple probe is damaged. 	<ul style="list-style-type: none"> ♦ Connect probe plug properly using diagram on page 7. ♦ Replace damaged probe.
<p>Any **ALARM** text is flashing and an audible alarm is NOT present.</p>  <p>LIQUID LEVEL 00.0 cm TEMP. XXX °C SYSTEM STATUS ALARM **ANY ALARM** RESET SOUND</p>	<ul style="list-style-type: none"> ♦ There is an alarm condition of some kind and the alarm MUTE is activated. 	<ul style="list-style-type: none"> ♦ Correct the alarm condition and then push the SOUND switch, so the audible alarm will be activated at the next alarm occurrence.
<p>**THERMISTOR OPEN** text is flashing and audible alarm is present.</p>  <p>LIQUID LEVEL XX.X cm TEMP. XXX °C SYSTEM STATUS ALARM **THERMISTOR OPEN** RESET MUTE</p>	<ul style="list-style-type: none"> ♦ Thermistor plug is disconnected. ♦ Thermistor is damaged. 	<ul style="list-style-type: none"> ♦ Connect Thermistor properly using diagram on page 7. ♦ Replace damaged Thermistor.

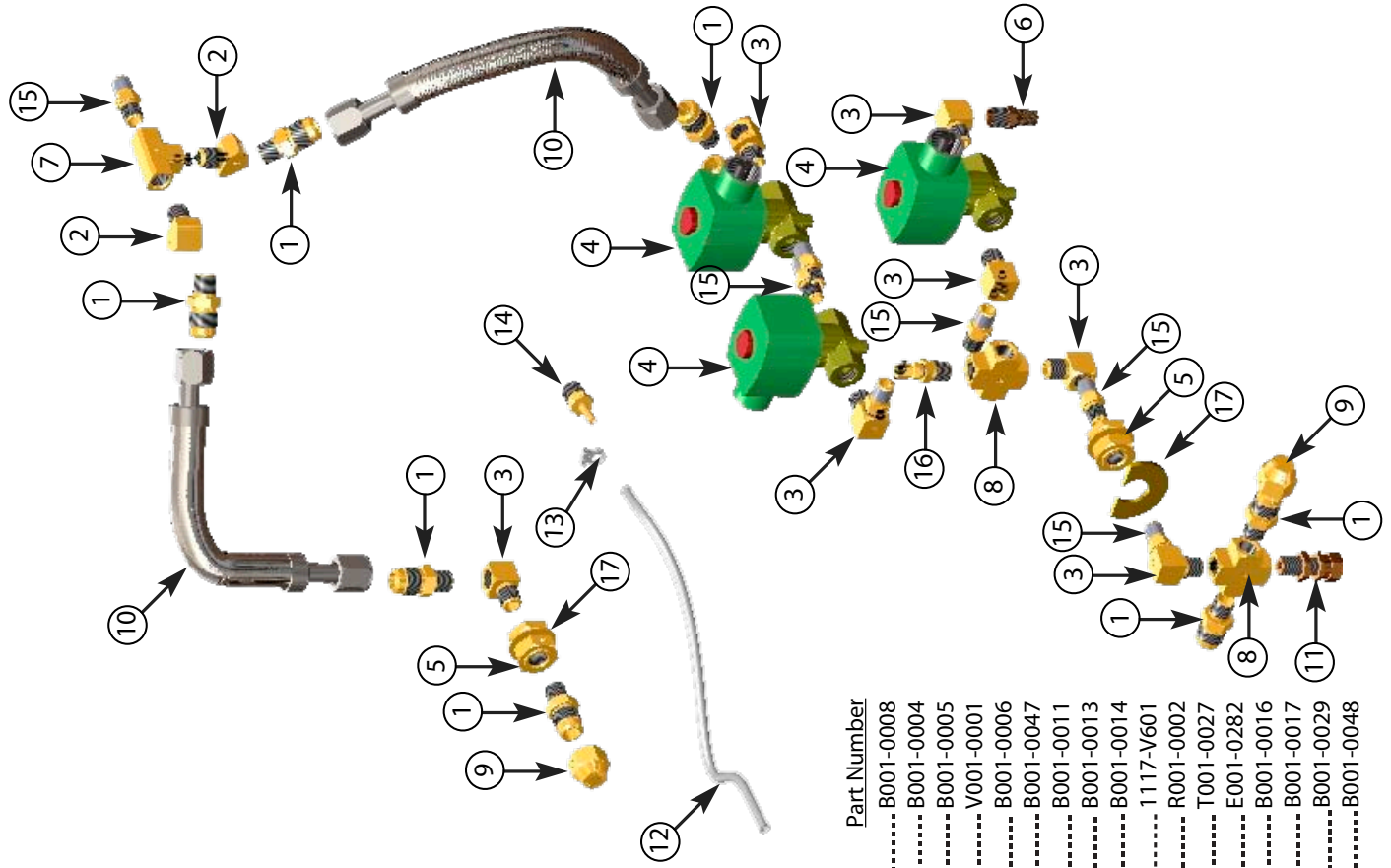
TROUBLESHOOTING GUIDE: ALARMS

CONDITIONS	CAUSES	SOLUTIONS
<p>**LN2 OVERFLOW** test is flashing and audible alarm is present.</p> <p>NOTE: This is an optional function, additional equipment is required. If overflow alarm is activated power to the solenoid valve is disabled.</p> 	<ul style="list-style-type: none"> ♦ Liquid level has become too high inside the vessel walls because of stuck solenoid, user error, etc. ♦ Disconnected sensor tube (see #7 on page 7) ♦ EH settings are enable on a non EH unit. ♦ High pressure supply 	<ul style="list-style-type: none"> ♦ Shut off manual valve on liquid supply, wait for the liquid to settle and do one of the following: <ul style="list-style-type: none"> - Carefully bail liquid out of vessel using approved cryogenic container and proper personal safety equipment, or - Wait for liquid to evaporate from vessel on it's own.
<p>Liquid Nitrogen has flooded vessel through internal vents. (V Series units only)</p>	<ul style="list-style-type: none"> ♦ Liquid level has become too high inside the vessel walls because of stuck solenoid, user error, etc. ♦ Disconnected sensor tube (see #7 on page 7) ♦ EH settings are enable on a non EH unit. ♦ High pressure supply 	<ul style="list-style-type: none"> ♦ Shut off manual valve on liquid supply, wait for the liquid to settle and do one of the following: <ul style="list-style-type: none"> - Carefully bail liquid out of vessel using approved cryogenic container and proper personal safety equipment, or - Wait for liquid to evaporate from vessel on it's own.
<p>No lights</p>	<ul style="list-style-type: none"> ♦ Blown fuse ♦ No power at wall outlet. ♦ AC power cord not plugged in. ♦ ON/OFF switch in OFF position 	<ul style="list-style-type: none"> ♦ Replace with two amp fuse. ♦ Use live power source. ♦ Plug the AC power cord into a wall socket. ♦ Move power key-switch into the ON position.
<p>Liquid level display showing incorrect reading.</p>	<ul style="list-style-type: none"> ♦ Obstructed pressure port. ♦ Loose sensor hose. ♦ Unit out of calibration. 	<ul style="list-style-type: none"> ♦ Clear blockage from pressure port in bottom of vessel. ♦ Check sensor hose connection. ♦ Calibrate unit using the calibration guide on page 29, 30.
<p>Remote alarm working improperly or not at all.</p>	<ul style="list-style-type: none"> ♦ Remote alarm wires connected to the wrong terminals. 	<ul style="list-style-type: none"> ♦ Reconnect wiring using the guide on page 12: <i>Remote Alarm Wiring</i>

Plumbing Wiring Diagram Part I.D.

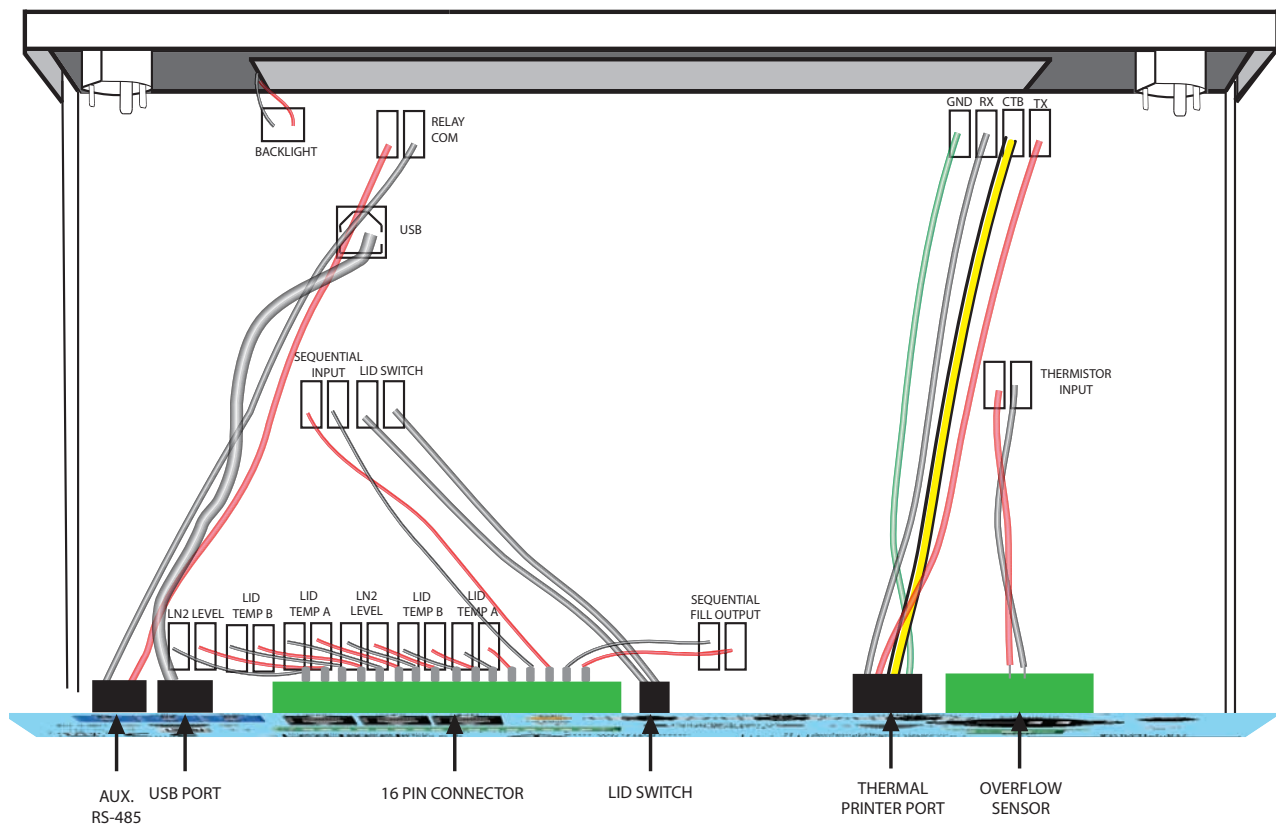
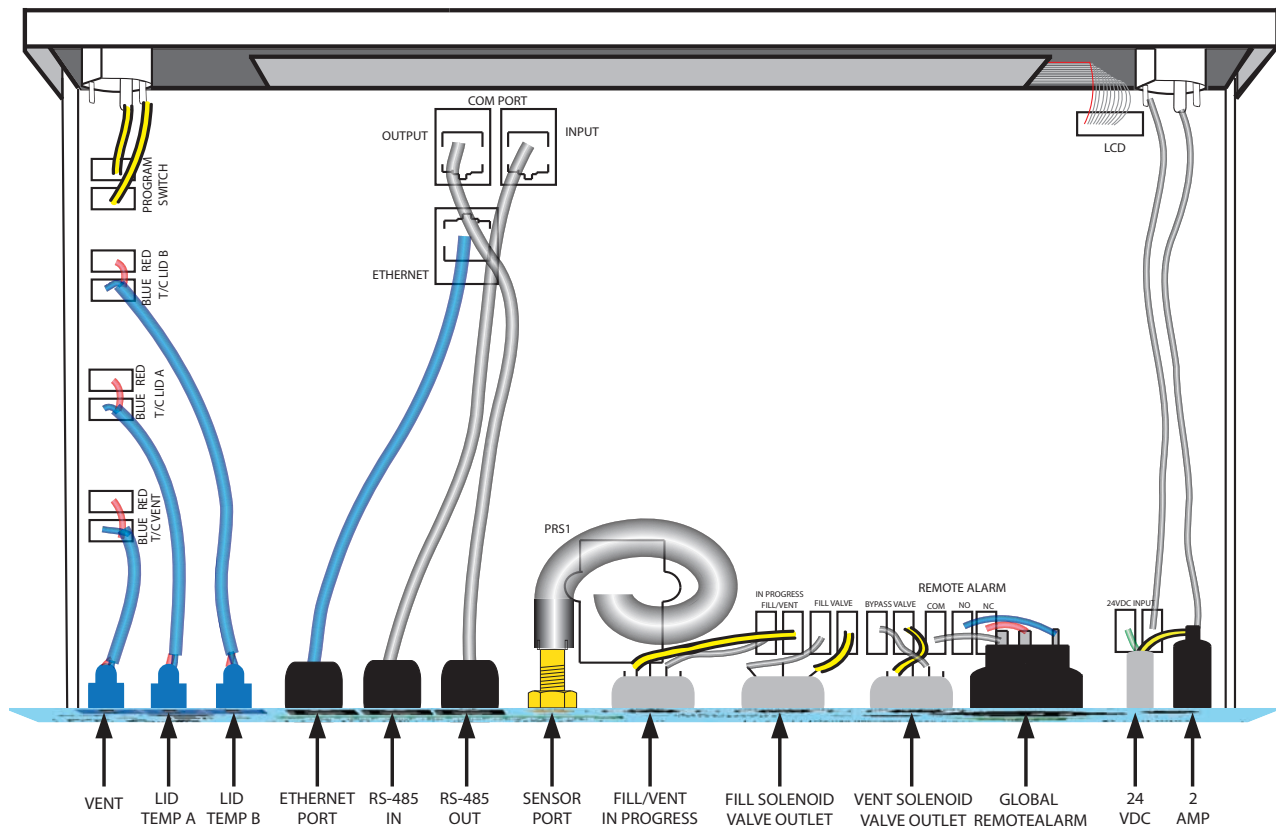


Plumbing Assembly Diagram Part I.D.

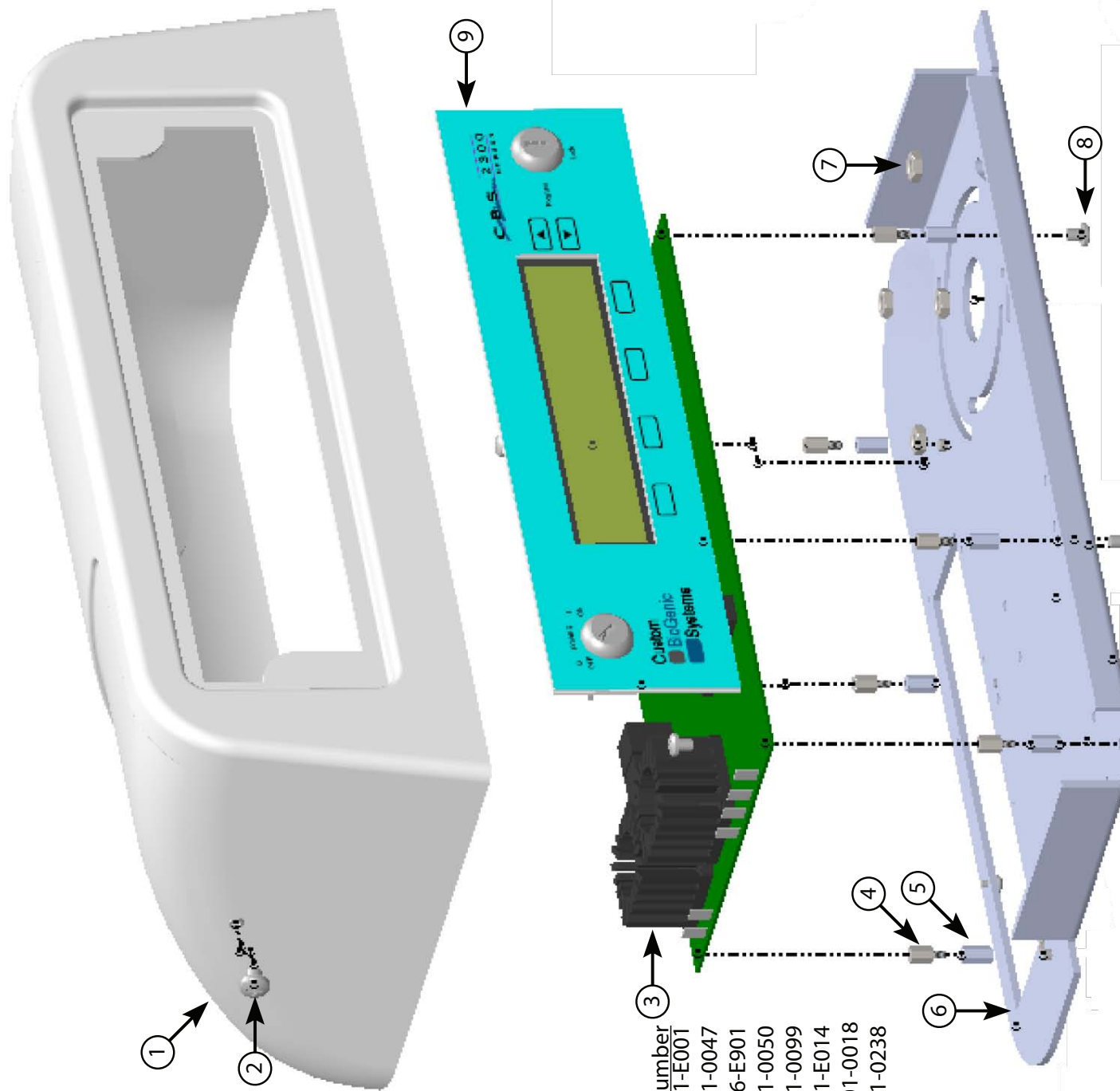


Description	Part Number
1) Male Connector.....	B001-0008
2) 45 Degree Street Elbow.....	B001-0004
3) 90 Degree Street Elbow.....	B001-0005
4) Solenoid Valve.....	V001-0001
5) Short Anchor Coupling.....	B001-0006
6) Arrow Muffler.....	B001-0047
7) 1/2" 3-Way.....	B001-0011
8) Cross.....	B001-0013
9) Flare Cap Nut.....	B001-0014
10) S.S. 9.5" Braided Hose.....	1117-V601
11) Relief Valve.....	R001-0002
12) Sensor Hose.....	T001-0027
13) Plastic Clip.....	E001-0282
14) 1/8" Hose Barb.....	B001-0016
15) Hex Nipple.....	B001-0017
16) Compression Fitting.....	B001-0029
17) Brass Flatwasher.....	B001-0048

2301 Controller Wiring Diagram Part I.D.

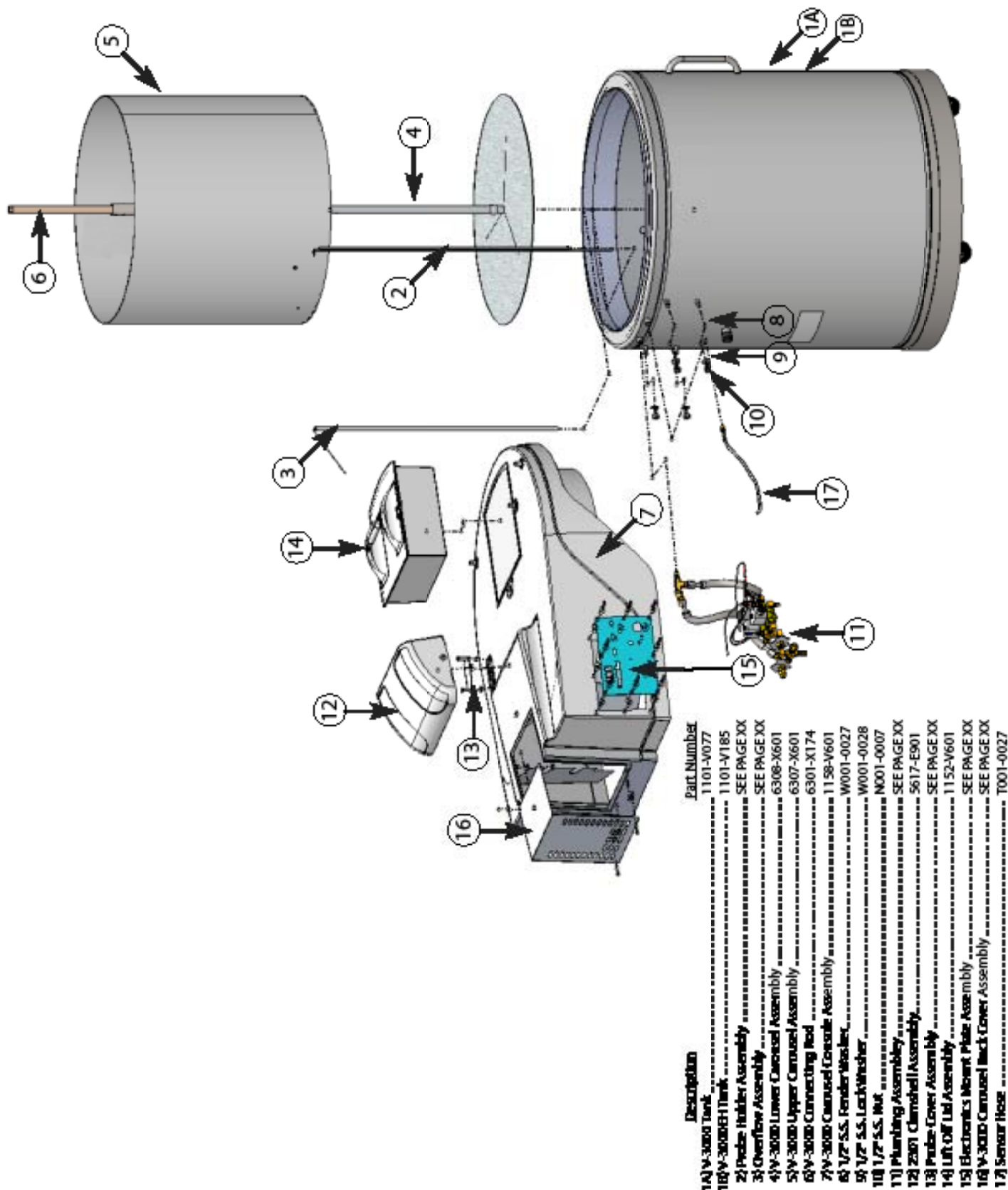


2301 Controller Diagram Parrrt I.D.

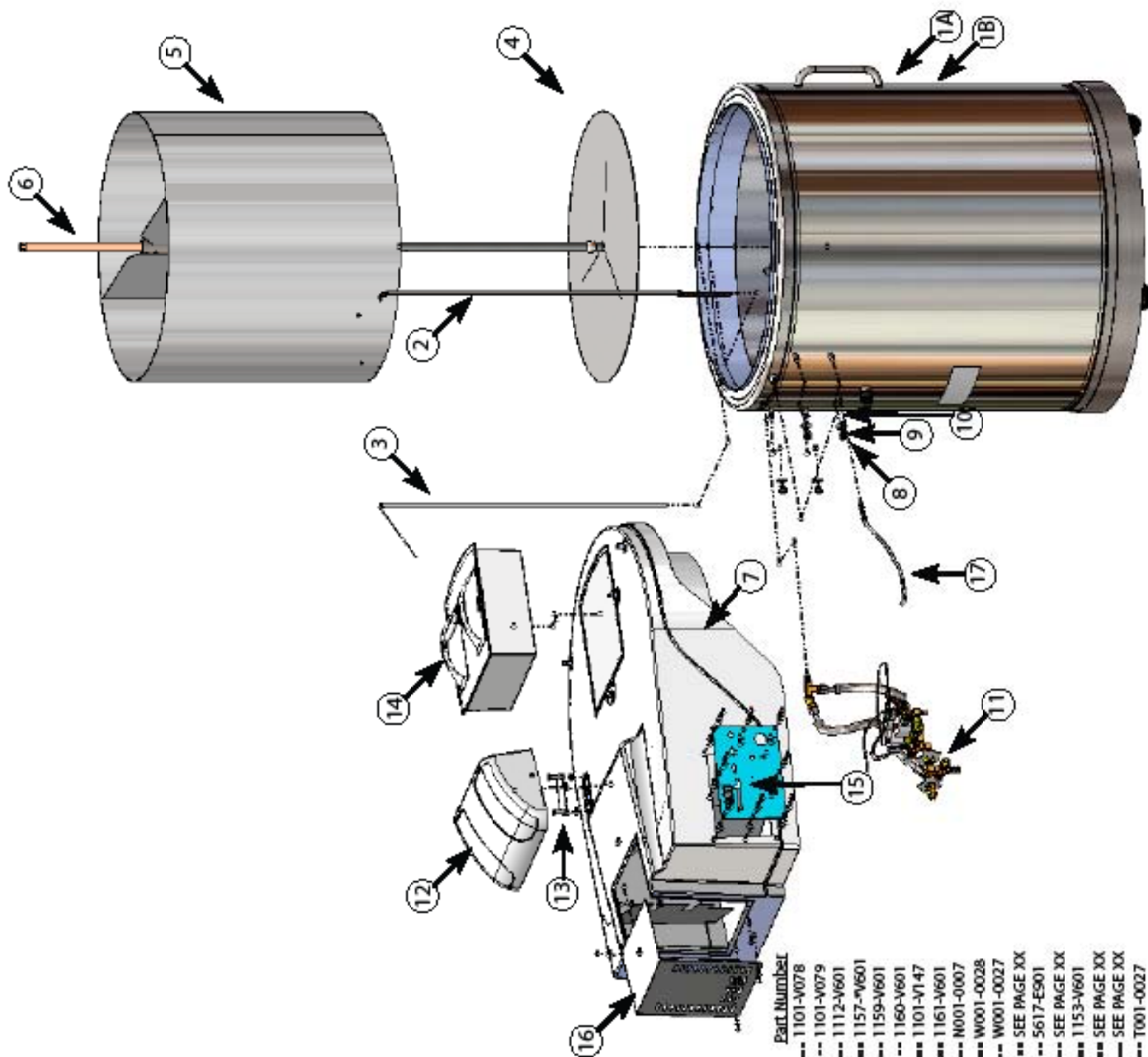


Description	Part Number
1) 5000 Controller Housing.....	5601-E001
2) 6/32" x 3/4" Panhead Screw.....	S001-0047
3) 2301 Controller Main Circuit Board.....	5616-E901
4) M/F 0.375" Standoffs.....	E001-0050
5) Female 0.375" Standoffs.....	E001-0099
6) 5000 Controller Base Plate.....	5601-E014
7) 1/4"-20 S.S. Panhead Screw.....	N001-0018
8) 6/32" x 1/4" SS Panhead Screws.....	E001-0238
9) 2301 Front Panel Assembly	

3000 Carousel tank Diagram Part I.D.



5000 Carousel Diagram Part I.D.



Description	Part Number
1A) 5000 Tank	1101-V078
1B) 5000H Tank	1101-V079
2) Probe Holder Assembly	1112-V601
3) OverFlow Assembly	1157-V601
4) 5000 Lower Carousel Assembly	1159-V601
5) 5000 Upper Carousel Assembly	1160-V601
6) 5000 Connecting Tube	1101-V147
7) 5000 Carousel Console	1161-V601
8) 1/2" S.S. Nut	N001-0007
9) 1/2" S.S. Lockwasher	W001-0028
10) 1/2" S.S. Flange	W001-0027
11) Plumbing Assembly	SEE PAGE XX
12) 2301 Clamshell Assembly	5617-E901
13) Probe Cover Assembly	SEE PAGE XX
14) Lift Off Lid Assembly	1153-V601
15) Electronics Mount Plate Assembly	SEE PAGE XX
16) 5000 Carousel Backover Assembly	SEE PAGE XX
17) Sensor Hose	T001-0027

CLEANING & MAINTENANCE

Sanitizing and Decontamination:

The CBS large LN2 storage units are constructed with an inner fabricated entirely from stainless steel. Any cleaning solution that does not react with stainless steel can be used in the sanitation process of these tanks. A mixture of 30% chlorine bleach with 70% water solution is considered the best method for decontamination. However, any household detergent or mild soap solution is suitable and can be used. This includes bleach, detergents, and mild soaps. Other cleaners and disinfectants that can be safely used include hydrogen peroxide, and denatured alcohol. NOTE: DO NOT USE ANY PETROLEUM BASED CLEANING SOLUTIONS.

To perform this sanitizing procedure, cover all inner surfaces with the solution, let stand for 30 minutes and remove. Spraying the solution into the inner vessel is preferred, although agitation of the solution inside the inner will suffice. Rinse the decontaminated surfaces with clean water and make sure all cleaner residues have been removed. Allow the tank to dry completely before putting back into service.

If you have any questions concerning decontamination process please contact Custom BioGenic Systems Technical Support 1-800-523-0072.

System Check

1. Test all alarm functions for proper operation.
2. Check any connected Remote Alarms or Automatic Dialing Systems to ensure proper operation. See page 26 for detailed instructions on how to manually cause a HIGH ALARM or LOW ALARM to test the remote alarm contacts.
3. Check for leaks at all connection points of the liquid nitrogen lines.
4. Be sure that all electrical wires are free of damage and plugs are firmly in place.

SOLENOID VALVE MAINTENANCE

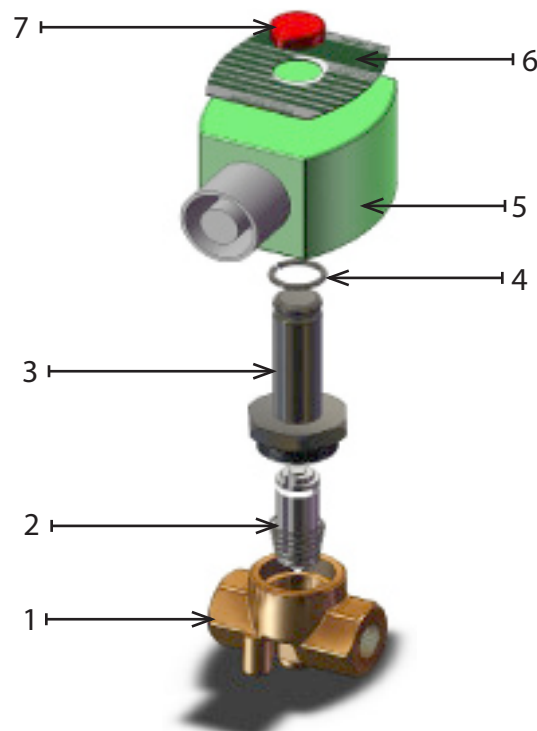
IMPORTANT: This should be done *only as required*, and is not a necessary part of maintenance.

Solenoid valve(s) may be opened to inspect for cleanliness and to check seals for wear.

Wipe seals with a clean, lint-free cloth. Distilled ammonia may be used to wipe seals if needed.

The solenoid valves may be opened and cleaned if they are not working smoothly. If this is done, use the diagram below to reassembly the valves properly. If the valve is found to be defective, it must be replaced, as replacement parts are not available individually.

1. Valve Body
2. Plunger
3. Flange
4. Valve Coil Locknut
5. Coil
6. Spec. Plate
7. Valve Cap



AVAILABLE FROM CBS

Liquid Nitrogen Equipment Including:

Freezers & Dewars
Controlled Rate Freezing Systems
Freezer Racks and Boxes
Transfer Lines
Solenoid Valves
Liquid Level & Temperature Alarms
Liquid Level & Temperature Controls
Temperature Recorders / Monitors
Cryogenic Accessories



**Custom
BioGenic
Systems**

150 Shafer Drive
Romeo, Michigan 48065 U.S.A.

2301ISOLN2.TM-Rev Org.

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